AVIATION

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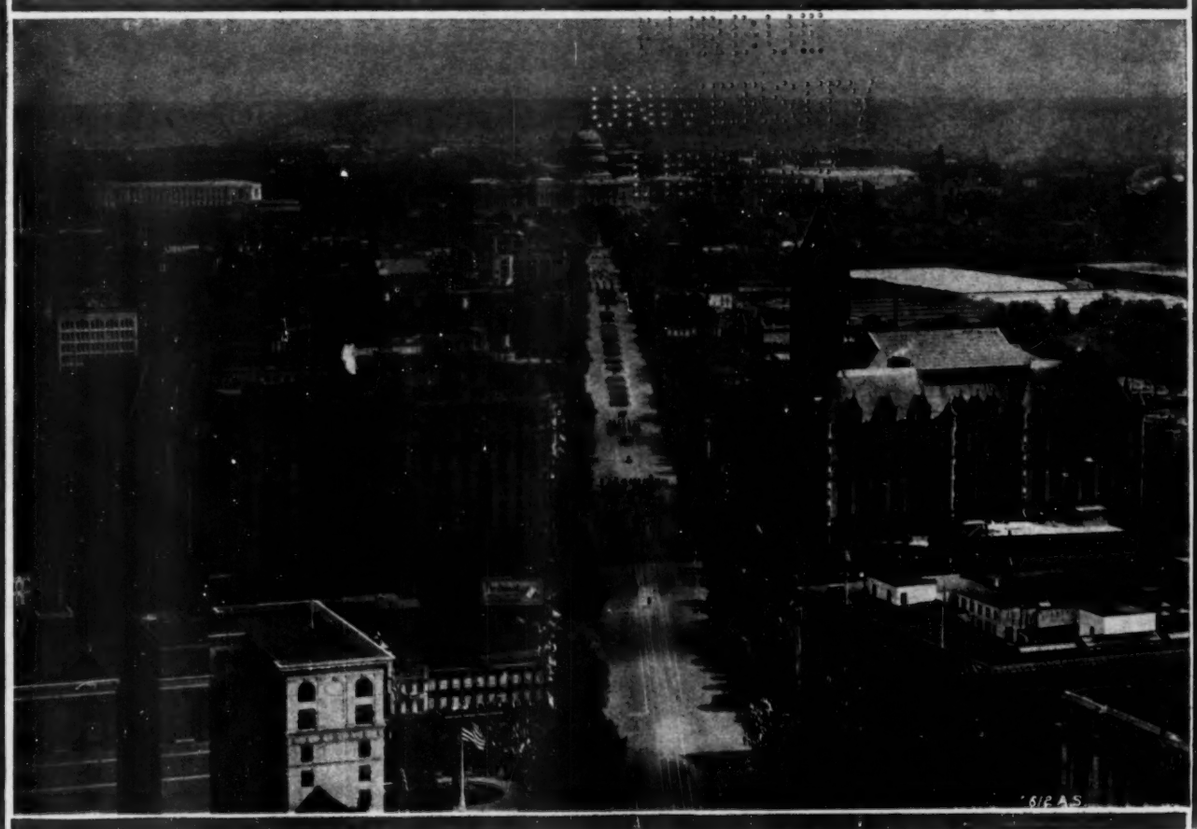

Aerial View of Washington, D. C.

VOLUME XIV

Number 1

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THE 2000 MILE FLIGHT OF THE ARMY FOKKER T2

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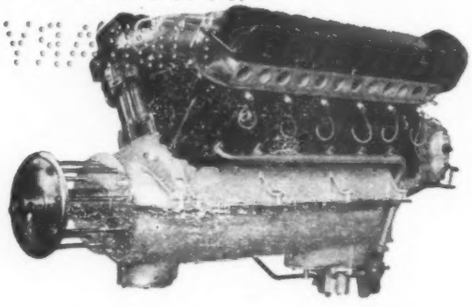

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JANUARY 1, 1923

AVIATION

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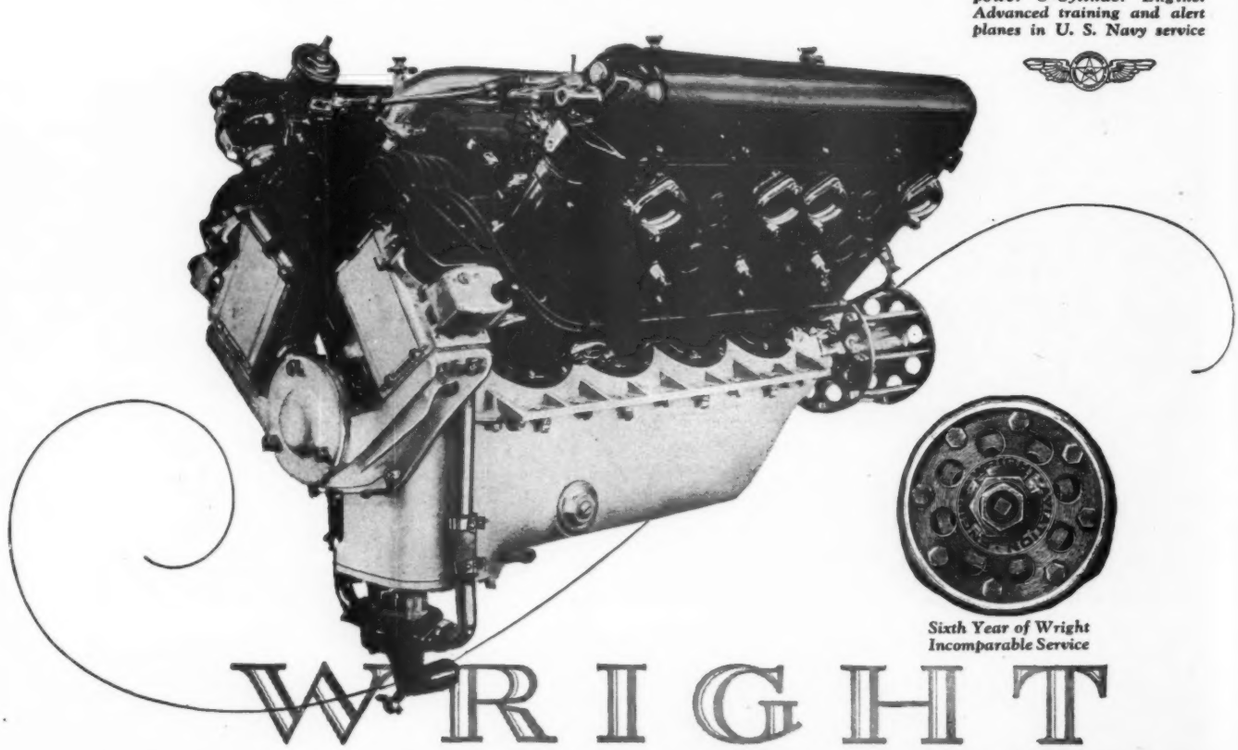

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The Aircraft Industry

THE most important problem for 1923, from the aeronautical viewpoint, concerns the maintenance of an aircraft industry in the United States. Judging from the 1922 record, unless a definite policy is adopted, there will be a situation created that will be a serious menace to the air defense of the nation.

The year 1922 has placed this country in the forefront of the world's aeronautical progress in engineering, construction and piloting. We have designed the airplanes. We have designed the engines. We have the pilots. But we are not likely to have much of anything unless the aircraft industry can be placed on a basis of solidarity and permanence.

We believe that much good will be derived from consideration of our general air policy as contrasted with that followed in certain European countries.

A request was received recently from the Spanish government for participation in a competition in Madrid, the purpose of which was to provide the Spanish Air Force with a nucleus of equipment. American manufacturers considered bidding for some of this work and possibly some of them would have done so, had it not been for a clause in the Spanish contract which required that all the equipment—except the demonstration plane and engine—be constructed within the kingdom. It was plainly the intent of the Spanish government to call upon the talent of the world and transplant as much as possible of it into a Spanish aircraft industry. This, from the Spanish viewpoint was admirable.

The *Australasian Trade Journal,* issue of October, 1922, contained a significant commentary on the policy of the British Air Ministry which is definitely designed to strengthen and enlarge the British aircraft industry. The paper states: "England's peril of invasion by enemy aircraft has recently become so palpable that even the most rabid advocate of 'National Economy' has had to listen to reason, with the result that orders have been placed for 500 new battleplanes." After listing sixteen airplane firms "among whom orders will be divided"—the paper adds: "The taxpayers' money will be spent among firms who are not mere opportunists in the science of aviation."

Contrasted with this policy of intense nationalism, we hear of our Air Service planning to send our most recent development in engines, the Curtiss D12, to a foreign designer to have him build a plane around it.

In his inaugural address. President Harding urged the necessity for developing a civilian aircraft industry as quickly as possible, as thereby the burden of maintenance by Federal appropriation would be the sooner diminished. With this policy there appears to be general accord among the officers of the Army and Navy Air Services, as well as among the officials of the Post Office Department. The trouble is that procrastination has suffered unwise practices to persist until it may now be said that the American aircraft industry is confronted with a crisis. This crisis can be attributed to several definite causes, some of which seem only spectres of the past, but should nevertheless be considered at this time.

First—Competitive Bidding. The civilian aircraft industry, as recognized by the President and the Air Service chiefs, is one that is responsible in financial reserve, competent in production facilities and progressive in engineering. By the present method of competitive bidding, a properly financed, well-equipped and thoroughly responsible aircraft company which, because of its known performance in the past, is regarded as an integral element in the administrations scheme of mobilization as recently outlined by Secretary Weeks, is compelled to compete in price with individual bidders who are lacking in financial reserve, responsibility or productive facilities and who therefore cannot be regarded as a substantial element. The result has been manifest in the withdrawal from the aeronautical industry of important companies.

Second—Government Competition. In the face of the administration's declarations for a sound aircraft industry to relieve the government from burdens now borne, there is noted a continuing tendency toward government competition. Funds appropriated for the construction of equipment are constantly being used for maintenance of activity in government plants. While all the departments in harmony with the administration's policy disclaim desire or intention to manufacture aircraft, it is nevertheless a fact that such manufacture or extensive or elaborate repair is going on, and forces are kept available for such work. With an overnight change of policy these forces could be made available for extensive aircraft construction work. The value of a federal check upon an established and powerful civilian industry is recognized, but in the case of aircraft, while the peacetime industry has not yet had an opportunity to become fully established, government competition operates unfairly and uneconomically resulting in continued dwarfing of civilian enterprise.

Third—Government Engineering. The practice of requiring constructors to build what is set before them has grown out of the policy of apportioning large sums for engineering development in government plants. The effect is not only seen in the maintenance of a civilian engineering staff by the goverment, but also in the encouragement of the belief that service aviation is sufficient unto itself, a belief exactly contrary to the administration's policy.

All of the above combine to create a situation which is rapidly growing intolerable. The situation is inconsistent with national policy as expressed and reiterated by the President, by the Secretaries of War and Navy and by the Chiefs of the Army and Navy Air Services. It can only result in forcing capital now invested in the exceedingly precarious aircraft industry to seek other channels, more profitable and better appreciated.

The 2000 Mile Flight of the Army Fokker T2

Official Report of Lieutenants Kelly and Macready On Flight from San Diego to Ft. Benjamin Harrison

The attempted transcontinental non-stop flight of Lieuts. Oakley G. Kelly and John A. Macready, Air Service, from Rockwell Field, San Diego, Calif. to Mitchel Field, Mineola, L. I. although it was abruptly terminated at Schoen Field, Ft. Benjamin Harrison, Ind., some 800 miles short of their objective, will remain one of the major performances in the annals of aviation. While the F.A.I. does not officially recognize distance records measured across country in a straight line because of the impossibility of adequately observing them from the ground, the 2000 mile flight of Lieutenants Kelly and Macready nevertheless remains in fact, if not officially, a world's record for the longest distance flown without stop by a heavier-than-air craft. The story of this great performance is related in detail in the official report which follows.

It will interest our readers to know that, far from being discouraged by their failure of making the coast-to-coast flight, the two pilots have requested the authority of the Chief of Air Service again to attempt the flight with the Army Fokker T2 which they used in the first attempt. It appears that this authority has been granted and that the flight will take place some time next spring. However, with the experience gained in their recent attempt, the two pilots are of the opinion that the most suitable direction for the next attempt would be from east to west.—EDITOR.

On landing from the endurance flight on Oct. 6, it was hoped by the pilots that a second transcontinental attempt could be made within the ensuing few days, in order to take advantage of the moonlight then existing, but maintenance troubles and bad weather made this impossible.

After Oct. 10 there was practically no moon. Had all weather conditions and winds been ideal, the pilots would have attempted flight during this period of total darkness, as the extreme cold weather was approaching. Flying would then be more uncertain and hazardous. All was in readiness to start on short notice; in fact, two starts were anticipated during this time, and the airplane was brought out at night to the end of the runway with the expectation of a take-off in the morning, but later weather reports were unfavorable and it did not appear good judgment to leave under the bad conditions.

Plotting Atmospheric Conditions

Close cooperation with the Weather Bureau at San Diego was obtained throughout this period. Two reports were obtained from this source daily, both local and general, and when the weather appeared to be shaping itself toward the possibility of a start, a telegram was sent to the Chief of the Weather Bureau requesting daily forecast from Washington. These Washington forecasts arrived in the morning at 7 a. m. and in the evening about 8.30 p. m. A combination of the two forecast sources formed the basis for decision.

Previous to Oct. 28 there was no period when all weather conditions were ideal, although sufficiently favorable at times to have warranted a start had moonlight prevailed.

The moon became noticeable about Oct. 28, and from this date the forecasts were watched very closely. However, the weather at this period was extremely unfavorable throughout the entire route, making a start impracticable.

When the transcontinental flight was first contemplated the prospective pilots had conferred with the Chief of the Weather Bureau at Washington to ascertain what simultaneous weather conditions might be expected over such a large area, receive information and data regarding the speed and direction of prevailing winds and get expert advice respecting the most logical point of start, whether on the East coast or on the West coast. Weather maps over a period of years showed an average wind velocity from west to east during the month of October at 22.5 m.p.h. Taking this fact into consideration, the Chief of the Weather Bureau unhestitatingly recommended that the start be made from the west coast and that the direction of the flight be toward the east.

A practical study of weather conditions during the period of waiting in San Diego disclosed the fact that a very important feature had been overlooked. It was very true that an average wind velocity from west to east of 22.5 m.p.h. prevailed during the month of October, but other unfavorable elements were combined with this factor entirely obliterating its value as a beneficial agent.

Winds blow in to fill up an area of low pressure and blow out from an area of high pressure, although the winds blowing out from a high pressure area are usually of comparatively low velocity.

An area of low pressure is usually a storm center while an area of high pressure indicates good, clear weather. These areas usually drift with various deflections in a general direction from west to east. Strong winds of great velocity blow into the low pressure area or storm center. A favorable wind for the transcontinental flight would be one blowing into a storm and a head wind would occur with good, clear atmosphere as a result of the high pressure.

Winds blow in a counter clockwise direction about a low pressure area and in a clockwise direction about a high pressure area.

After considerable investigation and study, it was determined that the ideal condition was one where an extreme low pressure area with a tremendous draught behind it had drifted across the continent to a position in the vicinity of New England, with this drift still continuing to the east, another low pressure area to the northeast of the start of the flight and a high pressure area about midway between the two low pressure areas and to the south or below the route of the coast to coast course. This arrangement would give a condition of wind direction similar to the cogs of a wheel, each area tending to wind the winds.

Projected Line of Flight 2850 Miles

Favoring winds were necessary to insure arrival at the destination. With a slightly favorable wind, in flying to the west a speed of 83 m.p.h. had been obtained with a gasoline consumption of 24 gal. per hour. The destination along the projected line of flight from San Diego to New York was 2,850 miles. The T2 had capacity for 725 gal. of gasoline; 30 hr. flight at 24 gal. per hour. At the speed attained in flying to the Pacific Coast, a distance of 2,490 miles was possible, 360 miles short of the necessary distance.

The pilots expected to overcome this handicap by a greater gasoline saving and by the help of favorable winds. Had the 22.5 m.p.h. average wind velocity originally relied upon been in actual existence under the right conditions, no difficulty or question would have existed. The logic of waiting for favorable conditions is apparent.

From Oct. 28 to Nov. 2 weather conditions were unsatisfactory, with indications that there would be no clearing along the route for a period of four or five days.

A report from the Chief Forecaster at Washington on the morning of Oct. 2 stated that weather conditions would not be propitious for a start within the next 36 hr. In the face of these reports it was not expected that a start would be made the morning of Oct. 3.

On the night of Oct. 2 the San Diego Weather Forecaster, Dean Blake, brought his maps to the quarters of the pilots in the U. S. Grant Hotel. Indications were for reasonably favorable weather with favoring winds for practically the

entire route. At approximately 9 p. m. a report was received from the Chief Forecaster at Washington, as follows:

"Weather conditions propitious for start Friday morning. Saturday conditions will be less favorable."

With the two forecasters agreeing on an almost ideal condition, there was no reason for delay. Lieutenant Macready, who was giving an address to the University Club of San Diego, was immediately notified by Lieutenant Kelly, who had received the reports, and final preparations for an early start the next morning were begun by the two pilots. It was necessary to gather men and get the huge plane out of the hangar at Rockwell Field in the intervening time between 10 p. m. and daybreak, and check over the airplane and warm up the engine during the night. It was also necessary for the pilots to complete final arrangements, payment of bills, packing, etc., before leaving, making their time of retirement well after midnight. A call was left for 3.30 a. m., permitting approximately three hours' sleep previous to the long trip.

On arrival at Rockwell Field in darkness at 5 a. m., with food and equipment for the trip, it was found that the plane was on the line ready for the start. It was necessary to await sufficient light for the take-off. At 5.57 a. m. the take-off was made with Lieutenant Kelly, pilot. The total weight of the airplane was 10,850 lb., approximately 155 lb. more than had been carried on the previous flight.

The Start

The experience of the original start came in good stead at this time, as the airplane was flown for several miles out to sea in almost a straight course, turning only enough to avoid Point Loma, and when it became necessary to swing back toward the coast the turn was very gradual, and without loss of flying speed. Two complete turns around North Island were made, and the transcontinental non-stop flight from San Diego to New York commenced.

The atmosphere was clear in contrast to the previous attempt. The T2 climbed better than had been anticipated. Temecula pass was negotiated without effort, as were also the higher mountains in the vicinity of San Jacinto and south of Banning, Calif.

From an altitude of 3,000 ft. at Banning, the country slopes down to below sea level at Salton Sea. The T2 passed the Salton Sea at an elevation of approximately 2,000 ft. and instead of going on south through the Imperial Valley to Yuma, a cut-off was made at Niland in an easterly direction to the Colorado River, which was crossed and the course continued to the Gila River. The Gila was partially followed, crossed diagonally, and in a short time the Southern California Railroad was picked up and followed. The pilots changed at the Colorado River.

The proposed route would take the T2 from Rockwell Field to Banning, Calif., south to the lower end of the Salton Sea, thence southeast to the Southern Pacific R. R., thence through Tucson, Ariz., to Deming, N. M.; northeast to Rincon, N. M.; north to Estancia, N. M.; thence to Santa Rose, N. M.; Tucumcari, N. M.; Dalhart, Tex.; Gaymon, Okla.; Wichita, Kans.; St. Louis, Mo.; Terre Haute, Ind.; Indianapolis, Ind.; Dayton, Ohio; Columbus, Ohio; Pittsburgh, Pa.; New York, N. Y., and Mitchel Field, Long Island. Certain deflections, which are hereafter noted, were made from this route to meet emergencies.

Early Difficulties

As the country around Tucson was approached, it became a continuous struggle with the climb at practically the absolute ceiling of the airplane in order to cross over the high passes, mountains, and elevations, the passing of each obstacle being doubtful. The atmosphere was very rough and bumpy, with numerous air currents, which would raise the airplane a hundred feet or more at a time, sometimes possibly two or three hundred, and then let it down quickly even though the same position or angle of climb of the airplane was maintained. It many times appeared that the T2 would not be able to get over these high areas, but apparently just as the summit was reached, one of the air currents coming over the high elevation would raise the airplane just enough to clear the top.

For long periods the T2 was flown within 40 or 50 ft. of the surface of the ground, more altitude being impossible of attainment. This was especially noticeable in the large plain areas west of Deming, N. M., where a terrific wind from the south was blowing, causing the air to be extremely rough and bumpy. Flying under these conditions with such a large and heavy airplane was very fatiguing, as much physical exertion was required.

At Deming an elevation of approximately 5,200 ft. was attained. This was the highest that the airplane would go at this point, as the pilot flying the airplane (Lieutenant Macready) had been desirous of passing on to the relieving pilot as much altitude as possible, knowing that an elevation of 6,800 ft. would be encountered within the ensuing few hours.

Change in Original Route

Lieutenant Kelly took the controls after leaving Deming, and attempted to follow the original course over the high elevations to the left of the Rio Grande River; but after a half hour's flight it was plainly seen that the airplane would run into the ground if a straight course was continued, so the pilot changed the route which had been previously planned, and attempted to fly up another valley considerably to the right. The valley carried the airplane over the deserted alkali dry lakes and the vast snow white salt marshes of New Mexico, and then over the Mal Pals, or ancient volcanic lava beds stretching beneath like a huge sheet covered with grotesque black tufts and masses for eighty or one hundred miles. This was a very strange and picturesque part of the flight. The airplane was flown close to the mysterious black looking volcanic craters.

It appeared that the airplane could not gain altitude sufficient to get over the country ahead, yet as each gallon of gasoline was consumed a few more feet of elevation was possible, due to the lightening of the load, and although it remained in flight hardly above the tops of the low hills and buttes, yet the airplane kept on until the higher elevations near Tecelote, N. M. were reached, and was being flown at an altitude of approximately 150 ft. above the ground. Here the current of air in blowing over the divide probably effected the atmospheric conditions causing a down current into which the T2 went diving toward the ground at the stalling point, but with terrific ground speed due to the exceedingly high wind. The airplane missed the cactus and shrubbery by a small margin and was stalled over the surface not over twenty feet above the ground for considerable distance, the occupants momentarily expecting a crash. A large mound was barely missed, beside uneven places of the terrain before the T2 was unsteadily maneuvered to better conditions. The Transport was flown back down the slope for approximately ten miles in an attempt to gain altitude while gasoline was being consumed with a resultant lessening of weight.

A second attempt was made in about 20 min. without success. It was necessary that at least 40 min. of gasoline be consumed before this high summit could be negotiated. When the required altitude was gained at a location approximately ten miles south of the divide, the T2 was flown across this high point, grazing the summit with about thirty feet to spare.

Nightfall

While gaining altitude through consumption of gasoline and resultant lessening of load, the sun had gone down. The summit was crossed at dusk. The night closed in very rapidly and location at this time was extremely difficult, as the moon had not come up and the sky was partially obscured by the clouds. An attempt was made to follow the railroad by flying over it and very close to the ground, but the track was soon lost in the darkness and for a period of at least one-half hour the exact position was not known.

If the pilots could reach Tucumcari, N. M., the long night's flight should be commenced from a known starting point and over comparatively good country. In a short time the lights of this small town appeared many miles to the right. Clouds began forming, but no great trouble was yet anticipated from these, although they partially obscured the moon, causing the darkness at times to be very intense and necessitating close

flying to the ground in order to observe the dim outline of the railroad.

Conditions at Night

Pilots were again changed, Lieutenant Macready relieving Lieutenant Kelly. A terrific south wind, causing considerable drift, was blowing directly across the course. Weather conditions became extremely bad. The clouds became lower and lower, and finally were so near the surface of the ground that it became necessary to occasionally pass through them or fly very low to keep below them. Sometimes the flight was so low that care and watchfulness were required in order to avoid the possibility of hitting farm houses, trees and buildings in the inky blackness of the night through inaccurate judgment of altitude, or an uncertain downward deflection of the line of flight.

Although it was intended to fly directly above the railroad tracks and keep the course in this way, the railroad would become lost in the darkness, and for considerable periods the pilot would be flying entirely by compass, estimating the amount of drift as best he could. Then the strong headlights of a train would appear in the distance and aid in the approximate re-location of the track. Thunder storms and lightning were on all sides and rain began falling, although this rain was not so heavy as to be a great barrier. The rain or heavy mist was annoying, as it made constant wiping of the goggles necessary.

It was not the conditions that the pilots were actually in which caused anxiety, as it was the expected conditions. Because of the many storms on all sides, it was anticipated that at almost any moment the T2 would plunge into a drenching rain or deluge of water. This did not occur. Considering the extremely bad weather surrounding the path of flight, the T2 was very fortunate in not encountering less favorable situations.

Tornado

Reference to any newspaper of Nov. 5 will convey the information that on Nov. 4, the night or early morning of the flight across Oklahoma or Kansas, a severe storm raged and a tornado swept over the same area traversed by the T2, causing a total of twelve lives lost and eighty people injured on this date and Nov. 5. From the standpoint of the weatherman this tornado was due to a low pressure area which apparently was of little importance but suddenly sprung into great prominence. The T2 missed the tornado, but received the surrounding bad weather.

At Pratt, Kan., the railroad was intentionally left and it was necessary to fly a compass course for several hundred miles. The lights of Wichita, Kan., were seen approximately ten or twelve miles to the right, about 40 min. after leaving the railroad at Pratt.

Flying by Compass

Reliance was placed on the compass from this point onward through the night. The route was entirely flown by compass, even the groups of lights which had occasionally appeared on the ground to mark the position of small villages, and which afforded a slight means of checking the course, having disappeared. The people of Kansas and Oklahoma apparently retire early, and no lights appear after ten or eleven o'clock. There were no large towns along the path of flight. For long stretches of thirty or forty minutes' flight, no lights of any description would appear. Occasionally the clouds would open up enough for a little light to come through. Then the section lines of the fields and roads would be dimly descerned on the ground.

These section lines were invaluable aids to the pilots, as they afforded a means of checking the compass along the lines running east and west. There was a cross wind approaching the proportions of a gale, causing considerable drift, the amount of which could only be ascertained at night by the occasional dim view of the known lines of direction. The exact amount of drift was attained through use of the section lines and the course flown accordingly at night after leaving the railroad. The T2 would be flown or "crabbed" along an east and west line and the approximate amount of drift estimated by reading the compass when the plane was actually traveling in a due east direction.

The maps were laid off according to scale in ten-mile distances along the intended course. The time was constantly being checked between known points on the ground. Although long stretches were flown without lights appearing, the compass course with the drift considered, was estimated so that it came approximately along the intended points and these points could be checked on the map by the lights. The time of approach and probable position of a town of sufficient size to have some street lights would be estimated and this object looked for when according to the map its location was approached. Its position would not always be found where expected, but would be close enough so that by using average judgment the group of lights could be designated as the town indicated on the map.

The general line of flight was toward a point on the Missouri River above its junction with the Mississippi. It was expected that the Missouri River could be picked up during the night at a point north of St. Louis. If doubt existed regarding location, it could be followed in a general direction to check the course at St. Louis. It happened, however, that the Missouri River was reached at the intended point. When the lights of St. Louis later appeared, they could be definitely recognized.

The pilots changed at the Missouri River, Lieutenant Kelly taking the controls.

Signs of Daybreak

Darkness still existed when the lights of St. Louis were passed, the first signs of daybreak showing in the east shortly after. It was a very welcome sight to the occupants of the airplane to see the outline of the horizon begin to appear, and when daybreak approached it was the thought of both that practically all troubles from the long trip were over, as the tremendous original weight of the airplane was gone, flying was comparatively easy, the storms had been passed through, the black night was over, and the pilots were in a country well known to both, and over which they had flown many times. Eleven and one-half hours had been spent in darkness.

The T2 passed through parts of six states during darkness—New Mexico, Texas, Oklahoma, Kansas, Missouri and Illinois.

A Cracked Cylinder Jacket

A short distance beyond Terre Haute, Lieutenant Kelly sent back a note to the effect that a forced landing seemed probable because of the rapidly decreasing water supply due to a cracked cylinder jacket on the engine.

Pilots were changed at this point. The relief pilot immediately observed when taking the front control seat that conditions were extremely bad, that the water was shooting from both sides of the engine in small streams and that this loss must be very great. The first cracked cylinder had been observed about four hundred miles from San Diego. It was not deemed of great importance at that time although it was watched very closely. The loss of water from this one cracked cylinder was not sufficient to have brought the ship to the ground before reaching New York, but the other cylinders which had gone in combination with this original one caused a loss of water so great that it was almost immediately seen that a forced landing would be necessary, as this loss was constantly increasing in volume.

Overheating of Engine

About 50 miles from Indianapolis the temperature began to rise very rapidly and the pilot turned back on the course to a field which had previously been observed with the intention of landing. It did not seem possible to continue onward. Lieutenant Kelly, however, who was in the rear, poured the coffee, consomme or broth and all other liquids into the radiator, and with this additional volume of liquid the airplane could be flown to Indianapolis Speedway, where it was intended to land.

On arriving at the Speedway it was estimated that the flight could be continued to Fort Benjamin Harrison, a military post where far greater facilities could be obtained. When over the speedway the altitude of the plane was approximately

3,000 ft. While flying over Indianapolis to Fort Benjamin Harrison the engine again began to heat very rapidly, a temperature of 110 deg. being reached. It was necessary to throttle down in order not to heat the engine excessively. The airplane was partially flown and glided to the Fort. A turn was made around the field to get the proper position to glide in for a landing. The engine power was practically gone, and the r.p.m. was very low. The airplane was flown almost to the edge of the field. When the throttle was pulled back the propeller stopped, frozen tight by the heat of the engine.

A good landing was made in the center of the field. The pilots immediately jumped from the plane in order to avoid the danger of fire which seemed slightly probable, as a dense cloud of white smoke was pouring from the engine. A Dodge touring car rushed out from Fort Benjamin Harrison with fire extinguishers, as the airplane appeared to be on fire.

The Commanding Officer of McCook Field was immediately notified by telephone, and the respects of the two pilots paid to the Commanding General of the Fifth Corps Area. A DH4B airplane was obtained from the Air Unit of the Fifth Corps Area and flown by Lieutenants Kelly and Macready to McCook Field.

One hundred and thirty-five gallons of gasoline remained in the tank when the plane was landed. It is very doubtful whether the T2 would have reached Mitchel with this supply of gasoline. It was the intention of the pilots carefully to estimate the greatest possible distance that could be flown and land either at Richmond Field, Staten Island, or at Washington, D. C., if the gasoline supply proved insufficient to reach Mitchel Field, L. I.

Food

The food carried on the trip consisted of a box of beef sandwiches, a half gallon Thermos bottle of strong hot beef broth or consomme, and a half gallon thermos bottle of very strong hot coffee. The broth and sandwiches were used to provide strength and sustain, and the strong coffee as a stimulant to keep the pilots awake. Before taking the controls, the pilot would drink some hot broth, eat a sandwich and swallow several draughts of the strong coffee, after which he felt in very good shape for the ensuing six hours or more at the wheel.

The Mechanics

Of slightly less importance to the work of the pilots was the work of the two mechanics, Charles Dworack and Clyde Reitz. These men put the T2 in the best possible condition for the flight and made many valuable original suggestions which were put to practical use. Their hearts were in the work, and the success of the attempt and the safety of the pilots was of as much concern to them as to any one interested.

The Commanding Officer and Officers of Rockwell Field did everything possible to insure the success of the enterprise. Their interest was entirely unselfish and sincere, and is deeply appreciated by the two pilots.

Physical Condition

Although naturally very tired toward the finish of the flight, neither pilot was in bad shape physically, all faculties, physical and mental, functioning normally through the entire period. The physical and mental strain of the transcontinental non-stop flight was far greater than that of the endurance flight, although the endurance flight was of much longer duration. The question of physical fatigue was the only factor to be considered in the endurance flight—the fact of flying 35 hr. without rest or sleep. There was no danger to be considered, and the mind was relaxed and at ease.

The non-stop flight was filled with continual danger and uncertainty. The brain must constantly be wide awake and alert. There was considerable nervous strain and anxiety which in itself was very tiring, and which, when combined with the actual muscular exertion of handling the big plane under the adverse weather conditions encountered, made the amount of fatigue considerable.

The Next Pulitzer Trophy Race

At a recent meeting of the contest committee of the National Aeronautic Association in Washington the details of next year's Pulitzer Cup race were discussed. Comdr. Jerome Hunsaker, U.S.N., Bureau of Aeronautics, told the committee that in tests in England it had been established that the human system cannot withstand the strain of a turn in which the centrifugal force is greater than four times gravity. This is caused by the heart action being insufficient to force the blood to the brain when this great force has been experienced.

Inasmuch as a violent turn of 90 deg. at a speed of approximately 200 m.p.h. causes a centrifugal force of approximately three times gravity, it was felt that the danger line was being approached to such an extent that a double pylon turn was essential for the safety of the pilot. Therefore, it was decided that the distance and pylon arrangement of the course for next year's race should be a total length of 200 kilometers, with four laps around a 50-kilometer equilateral triangle, using two pylons at the turns instead of one, assuring a wide turn.

It was also decided to have a single basis for the minimum factor of safety for monoplanes and biplanes, and seven and a half was decided as a satisfactory factor of safety for all parts of the planes.

The maximum landing speed, after due consideration, was decided upon at 75 m.p.h. limit, being the same that was used at the 1922 Pulitzer races. However, the minimum high speed under which a plane could enter the race was increased to 175 m.p.h.

A restriction was placed on the contestants, in that they must retain the landing gears originally used. While retractable landing gears will be allowed, no contestant will be permitted to drop his landing gear after once taking the air.

After the experiences at Omaha in 1921 and at Detroit in 1922 it was the consensus of opinion among the committee that the courses to be flown should be over water if possible.

The Navy was represented at the meeting by Comdr. J. C. Hunsaker and Comdr. M. A. Mitscher, the Marine Corps Aviation Section by Col. T. C. Turner, and the Army Air Service by Maj. Horace M. Hickam, Maj. H. A. Dargue, Maj. I. A. Rader, Capt. St. Clair Streett, Lieut. A. J. Maitland (winner of the second Pulitzer race at Detroit), and Lieut. T. J. Koenig.

While the location of the contest for the Pulitzer Cup race for 1923 has not been decided upon, a sub-committee was appointed to view localities considered desirable to conduct the races, and representatives of the Army and Navy Air Services will send their representatives on the tour of inspection with the National Aeronautic Association committee.

St. Louis Wants 1923 Air Races

Maj. Howard F. Wehrle, Vice-President of the Air Terminal Association of Kansas City, Mo., and a Governor of the National Aeronautic Association, was a guest at a dinner tendered two weeks ago by the St. Louis committee seeking to obtain the 1923 National Air Races. At the meeting of the N.A.A. governors in New York Jan. 15, Major Wehrle will make a report on facilities and preparations for the proposed meet at St. Louis.

Fifth Aviators' Ball

The Fifth Annual Aviators' Ball will take place on Wednesday, Jan. 3, 1923, at the Hotel Astor, under the chairmanship of Laurence Latourette Driggs. The ball is given for the benefit of the New York Flying Corps. Address Aviators' Ball Committee, 8 W. 40th St., New York.

Aeromarine High Efficiency Wing Curve

As Applied to U. S. Model WM Mail Airplane

By Paul G. Zimmermann, M.E.

Engineer in Charge, Airplane Division, Aeromarine Plane & Motor Co.

Skeleton of the Aeromarine wing built for the WM mail airplane

Since the advent into this country of the internally braced monoplane using the high lift aerofoil, this type of wing section has been given much consideration by all engineers. Our research department, after studying the performance of the various internally braced monoplanes, came to the conclusion that undoubtedly as good, if not better, results could be obtained by the use of the high lift aerofoil in externally braced biplane construction. It was found, however, that the various high life aerofoils available at that time were entirely too thick for this purpose and that much needless weight would be added to a biplane wing panel designed with one of these aerofoils. A series of investigations was planned for the purpose of developing a thin aerofoil with the properties of the thick high lift curves which finally resulted in the two very efficient high lift aerofoils known as the Aeromarine No. 2 and No. 6 and described in AVIATION of March 13, 1922.

In order effectively to test one of these curves in actual practice, it was decided to calculate the performance of some standard plane equipped with them and, if the results were favorable, to apply the wings to an airplane. The DH4 was chosen because of the acknowledged efficiency of the RAF 15 aerofoil as installed on this type of plane. The results of these calculations are shown in Table I. The performance estimates may not be entirely correct, but the percentage of change indicated has since been proven to be very nearly accurate.

A proposal for the construction of a set of panels, which would give the results as outlined, was submitted to the Air Mail Service. This was accepted and it was decided to incorporate these wings on the Model WM mail plane at that time under construction. This plane, which was designed and built by Capt. J. E. Whitbeck of that service, consisted of a DH fuselage, remodeled to a 40 cu. ft. mail carrying capacity, which would allow a mail load of about 800 lb. to be carried. The increased capacity was added to the bottom of the fuselage.

The addition of this belly undoubtedly materially increased the resistance of the fuselage. However, the first tests of the combination, which were performed in the spring of 1922, indicated the high speed had not been materially decreased. It was found that the maneuvering qualities of the airplane in the air were not greatly changed with the variation of load from 200 to 800 lb. The zooming power seemed to be somewhat less than the DH4, while the low speed was materially decreased.

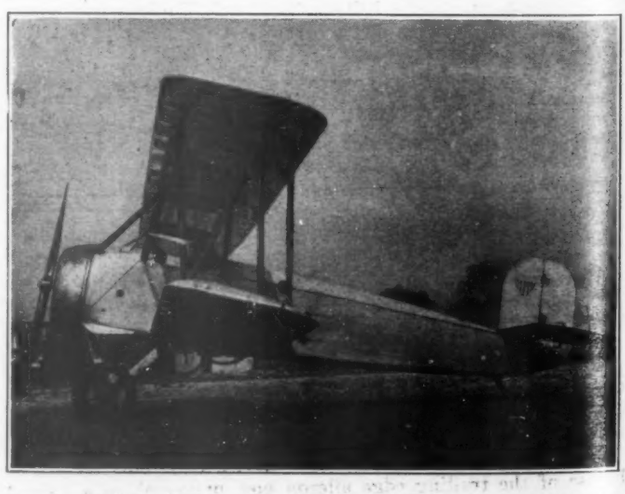
It was also found that, in order to obtain the best performance in climb from the plane, the angle of incidence would have to be much greater than is usual on the standard DH4 mail ship, while to obtain the lowest speed in landing and take off a greater angle was needed than it was possible to obtain with the first installation. The angle of the wings on the fuselage was, therefore, changed from 1½ deg. to 3 deg., which materially aided in reducing the low speed and take off. The time of take-off was 11 sec. on this plane, while a DH4 takes off in 9 sec., but the run was much shorter in the case of the former.

After the preliminary tests trips between New York and Cleveland with an 800 lb. load were made. In five trips of this ship the cruising speed was found to be 96.34 m.p.h. while a regular DH4 flying on the same days, and carrying 400 lb. of load, cruised at an average speed of 97.8 m.p.h. The top speed when carrying 800 lb. mail load, as indicated by electrically timed tests, was 115.3 m.p.h., the motor running at 1725 r.p.m. with the regular club propeller 9 ft. 2 in. in diameter and 7 ft. 6 in. pitch.

The ship has been flown for twenty minutes at 1075 r.p.m. with the airspeed indicator showing 68 m.p.h. without losing altitude and having fair maneuverability at all times. The climb shows 800 ft. the first minute and 5150 ft. in 10 min., as compared with 1000 ft. the first minute and 6500 ft. in 10 min. for a regular DH4 mail plane. On one trip to Washington a sand load of 1032 lb. was carried and the performance of the ship was considered very good even with this load. Since these figures have been obtained streamline wires have been added and a high speed of over 118 m.p.h. obtained. Other tests with the machine so equipped have not been completed.

TABLE I

Item	*RAF15*	*Aeromarine 2*	*Per cent change*
Pay load (mail)—lb.	400	800	+100
Total weight loaded—lb.	3920	4320	+ 10.2
Landing speed—m.p.h.	55.4	49.5	— 10.6
Max. speed, sea level—m.p.h. ..	120.0	113.5	— 5.4
Max. speed, at 10,000 ft.	111.0	106.0	— 4.5
Climb in 10 min., ft.	8600	7700	— 10.5
Abs. ceiling, ft. 17500		16900	— 3.4
Gasoline consumption in gallons per 100 lb. of pay load per 100 miles at altitude of 5000 ft. and speed of 95 m.p.h. ..	5.83	3.06	— 47.5



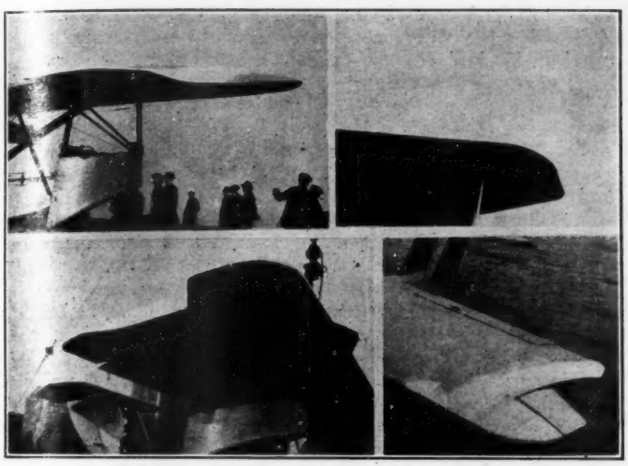
Dayton-Wright "Chummy" (110 hp. LeRhône)—a two-seater side by side training plane which proves popular with students and instructors alike

New Type of Flying Control Proves Successful

Demonstration of the Loening Lateral Pressure Equalizer

Successful tests of new type of transverse airplane control, the invention of Grover C. Loening, the aircraft constructor, recently took place over the East River off 31st Street, where the factory of the Loening Aeronautical Engineering Corp. is located. The tests were made with a Loening monoplane air yacht owned by Harold S. Vanderbilt and piloted by S. W. Cogswell, Mr. Vanderbilt's pilot.

The new invention, which is called a lateral "pressure equalizer", is mounted on the extreme tip of each wing and departs radically in its effect from the fundamental principles of lateral control as used in the Wright and Curtiss types. Previously used systems for lateral control on wings have always mounted the movable surface or aileron on the trailing edge of the wing, fastened back of the rear spar of the wing.



Four views of the Loening lateral pressure equalizer as fitted to Harold S. Vanderbilt's Loening air yacht

The competition in the recent air races at Detroit, however, where monoplanes made speeds of over 190 m.p.h., even though not streamlined as well as the biplane racing machines, proved that the old type of control of the monoplanes with an aileron at the rear of the wings became increasingly ineffective with high speed. This feature was studied by many experts and it was found that the tendency of the old type of lateral control was to put twisting stresses on the wing, which neutralized the controlling power of the ailerons in such a way as to make the machine stiff on the controls.

The pressure equalizer invented by Mr. Loening has been found to do away with this effect because the movable surface used to obtain more lift on one side than the other, is placed entirely in front of the center of the wing, so that the effect of this increased pressure, by tending to twist the wing, causes the twisting stress to be completely reversed in favor of the lateral control instead of against it. The operation of the movable pressure equalizer tending to lift one side of the wing causes the angle of incidence of that side of the wing to increase, thus still further amplifying the controlling power and completely equalizing the twisting stresses induced by the old type of control.

The construction of the new device is quite simple, in that a small section of the leading edge of the wing is extended out beyond the tip to which is hinged the pressure equalizing flap, which is controlled, through cables and levers, by the pilot.

Mr. Loening claims that the new device is so effective that the use of the trailing edge aileron now universal on all airplanes may be eliminated entirely and much more controlling power obtained with the new device with one-quarter of the area of moveable surface, and with a great reduction in the power the pilot needs to apply to his control stick. He believes the new device again emphasizes the qualities of the monoplane in comparison to other types of machines in that it is now possible to preserve its lightness and simplicity without any sacrifice of control whatsoever, and to obtain to the best advantage the superiority in speed and climbing power.

The new control can be applied to biplanes and other types of machines but is most valuable for monoplanes due to the depth of chord of their wings.

The actual tests of the pressure equalizer were particularly interesting as the weather consisted of high Northwesterly winds blowing across the river, and full of violent and disturbed wind puffs. Ordinarily, flying so near the city under these conditions, with the additional necessity of the seaplane having to take the air from the river across the wind, would have been considered quite impractical and dangerous. However, equipped with the new control, the ship was found so responsive in overcoming wind puffs that flying under these conditions was entirely safe.

Aircraft Radio Development

The annual report of Maj. Gen. George O. Squier, Chief Signal Officer of the Army contains the following reference to aircraft radio development during the past year:

For the Air Service two 100 mile range telephone and telegraph sets were especially developed; one for large airplanes like the Martin Bombers and the other for use at ground or base stations. The ground station apparatus uses two 250 watt tubes in place of ten 50 watt tubes. Since the end of the fiscal year contracts for the development of both these designs have been let to commercial electrical companies for completion. The perfection of a 5 mile range set for inter-plane communication employing the Armstrong receiving system and intended to be used on pursuit planes in formation flying, has also been placed in the hands of manufacturers, due to lack of Signal Corps personnel.

Contracts have been awarded for the production of a number of new airplane radio sets with a 30 mile range, using two 50 watt tubes. The apparatus is split up into several units which are distributed in the plane and controlled from the dash board by the pilot. Work on a radio telephone mule pack for use in mountain artillery was also underway but uncompleted at the close of the fiscal year. Considerable progress in the design and testing of a radio telephone set for use in Army tanks was accomplished. The development and test of a five station inter-phone set for use in the Martin Bombers was also progressing well.

Other developments included work on a field telephone repeater for use in coupling line and radio communication, especially in balloon communication; the perfection of a direction finder for the Coast Artillery Corps, and tests with the resonance wave coil antenna for the elmination of static, revealed that where large antenna cannot be reerected, and on portable sets, this apparatus may be of great advantage.

Austria May Build Aircraft

The restriction in the Treaty of St. Germain, which prevented Austria from manufacturing and owning airplanes, has now been rescinded. However, as permission at the present time is granted only for aircraft of a nonmilitary nature and as the Powers have stipulated the right to control Austrian activities along the line of aircraft construction, the size and capacity will naturally be limited. Austrian government control will be conducted by the ministry of railways.

The Past Year and American Aviation

Chronology of 1922 Prepared by Aeronautical Chamber of Commerce Gives Outstanding Aviation Achievements

During the past twelve months the United States took the lead in practically every phase of aeronautics, American pilots flying American aircraft powered with American engines obtaining such results as to warrant the assertion that theirs has been the most significant series of achievements made in the recent history of mechanical flight. This fact is well borne out by an aeronautic chronology of 1922 which the Aeronautical Chamber of Commerce has just issued, and which is reproduced herewith in parts.

While other nations have lost no time in fostering air transport, they have been hampered by economic and political conditions; and despite strong financial support from their respective governments, they have not been able to out-fly this country. While other nations have had the benefit of the very necessary and strongly defined national aerial policies backed up by air codes and subsidies, commercial aviation in the United States has managed to carry on an active and constructive program, though here air law and government policy were lacking.

While we have not at present a government bureau supervising civil aerial transport, there is reason to hope for one in the near future. The Wadsworth-Winslow Bill, which passed the Senate last February, provides for a bureau of civil aeronautics in the Department of Commerce. By its terms it is proposed to promulgate and administer an aerial code and generally supervise commercial flying by registering and certifying pilots and planes, foster the construction of public airports and lay out a network of air routes throughout the United States.

This measure has received widespread indorsement. It is now being studied by the Department of Commerce and Representative Samuel E. Winslow, Chairman of the House Committee on Interstate and Foreign Commerce, in order to improve its provisions from the viewpoint of constitutionality; its relation to the International Air Navigation Convention; certain departmental details; adapting the Customs, Immigration, Public Health and other regulatory legislation to air travel; administrative details; questions with respect to crimes and court jurisdiction and general questions of form, arrangement and clarity of expression. This work is important and should the Bill become a law it will provide a most constructive element in our new national transportation system. Many states during the year created aviation commissions and passed temporary laws to regulate aerial traffic until a national code becomes effective.

New World's Records

During the year many more world's records came to America. In October Brig. Gen. William Mitchell in an Army-Curtiss biplane averaged 224.58 m.p.h. over a straightaway course, thereby wresting the record from Sadi Lecointe who a month before had attained an average 213.575 m.p.h., under similar conditions in France. In making this record General Mitchell flew the biplane equipped with the 375 hp. Curtiss D12 engine in which Lieut. R. L. Maughan of the Army Air Service won the Pulitzer Trophy Race, flying 250 kilometers, closed circuit, with fifteen turns, at an average of 205.8 m.p.h. In that race Lieutenant Maughan also broke the international record for 100 and 200 kilometer closed and straight course flying. Six other airplanes had broken the 50 and 100 kilometer records in the same race before Maughan's remarkable performance. All the planes were American with American motors.

In connection with the National Airplane Races at Detroit more than 290,000 miles have been flown, two-thirds of it cross-country travel, by Army, Navy, Marine Corps and Air Mail and civil machines bound for the races from all parts of the country. There were no serious accidents. The same applies to the operations of Aeromarine Airways, the largest and most successful flying boat service in the world. This firm on its New York-Atlantic City, Key West-Havana, Miami-Nassau and Bimini lines and Detroit-Cleveland service, safely carried more than 10,000 passengers and thousands of pounds of freight. More than 500 civilians learned to pilot their own machines. They were students at civilian flying schools located in a dozen states.

New Types of Airplanes

At least twenty new types of airplanes were completed or started in as many factories. Great progress was made in design and construction methods. Instruments were perfected and methods improved for handling all kinds of material employed in aircraft constructed. Leaders in the various industries developing raw materials established aeronautical departments during the year, thereby recognizing the increasing importance of the flying machines. Seventy-two trades are now represented in the construction of aircraft. The Dayton-Wright, Elias and other new type machines for training and commercial use, construction of all-metal planes and improvement over existing types were other achievements. The military and naval air services recognized as standard the Thomas-Morse, Loening, Douglas, Vought, Martin, Aeromarine and Curtiss machines recently produced or improved.

The Arms Limitation Conference declined to limit aircraft because by so doing the commercial growth of flight might be handicapped. Great national organizations such as the Chamber of Commerce of the United States, American Bar Association, Society of Automotive Engineers, American Society of Mechanical Engineers and others, co-operated with groups including the Department of Commerce, National Advisory Committee for Aeronautics, National Aircraft Underwriters Association, Aero Club of America, the Aeronautical Chamber of Commerce and the Manufacturers Aircraft Association in impressing upon the country the need for developing aviation for transport as well as for the national defense. In this work, they had the whole-hearted support of the federal, military and naval branches.

The National Advisory Committee for Aeronautics, realizing that before definite improvement in aircraft could be made, accurate information on existing planes should be obtained. Accordingly, during the year some remarkable instruments were perfected for registering airplane tests, without depending on the pilot's individual opinion concerning performance qualities of a new machine.

Aerial photography has become an important branch of civil air activities chiefly owing to special equipment developed by Messrs. Fairchild and Eastman during the year. Radio communication has progressed rapidly under the experiments of the Federal bureaus and the Radio Corporation of America.

New Aeronautical Engines

New high powered engines, such as the Packard and Wright, of 600 hp.; the Aeromarine U873, which passed the Navy 300 hr. test; the Curtiss D12, which attained world wide fame through its performance in the Pulitzer Trophy Race; the Lawrance radial air-cooled motor, winner of the last Curtiss Marine Flying Trophy race were still another important development of the year.

The United States Air Mail Service has continued its wonderful demonstration of practical flying. Its actual operations have been confined to the transcontinental route between New York and San Francisco. Mail planes in July had completed their fourth year of flying operations, covering a total of 1,750,000 miles in twelve months without a fatality and carrying 49,000,000 letters. Several new planes were developed for mail carrying service. One of the many improvements is the Aeromarine high efficiency wing which greatly improves the useful load of the standard U. S. mail

plane. Another new wing which increased the performance of certain types of planes was developed by Lawrence Sperry, who also perfected a special skid landing gear which so reduces the landing speed to permit of landing in very small spaces. Many other devices were created to make the airplane easier and safer to operate, among them the lateral 'pressure equalizer' which Grover Loening installed on his monoplane air yacht. The development of the reversable propeller, the super-charger and the Gallaudet geared propeller mechanisms is being carried on at various laboratories and factories. The world's altitude record made by Lt. J. A. Macready in 1921, which was made possible by the supercharger developed by the Army Air Service at McCook Field, has not so far been surpassed. Parachutes have become dependable, and many high altitude jumps were made by Army aviators. Last June Capt. A. W. Stevens broke the official record by dropping 24,206 ft. over McCook Field.

Some Notable Flights

A notable flight was made on April 17, when Clifford Webster in a Loening air yacht flew with a passenger from Palm Beach, Fla. to New York between daylight and dark. His flying time was 9 hr. 56 min. for the 1220 miles distance, which he covered with one stop for fuel. Another remarkable performance was made by Army pilots in September when Lieuts. Oakley Kelly and J. A. Macready flew 2060 miles between San Diego, Calif., and Indianapolis, Ind. without stopping. A few days previously they had made a record duration flight remaining in the air 35 hr., 18 min. 30 sec., in the same plane, an Army-Fokker T2 monoplane equipped with a Liberty engine.

The Army airship C2 made a fine cross-country flight between Langley Field, Va. and Ross Field, Calif. in a successful test to demonstrate the possibilities of airship navigation from coast to coast. Many other long flights have been made by army fliers. Lt. James H. Doolittle on Sept. 5 made a one-stop flight from Jacksonville, Fla. to Coronado, Calif., 2,275 miles in 21 hr. 19 min.

The mapping of the Mississippi delta, completed during the year, is a notable instance of the valuable peacetime work rendered by the services, as is the forest fire patrol maintained by the Army Air Service. Eighty-seven planes equipped with radio operated over the National forests on the Pacific Coast, saving millions of dollars worth of standing timber because the aerial observers could detect and report small fires before they got beyond control. Naval aviation reached a high degree of efficiency in defensive work. In September naval torpedo planes operating off the Virginia Capes demonstrated the practicability of torpedo attack from the air. In August a naval fighting plane squadron made at San Diego an enviable gunnery record in aerial combat, attaining a maximum of 145 direct hits in 27 sec.

The lighter-than-air program has been continued with all the facilities at the command of the army and navy forces. The rigid airship ZR1 is now being completed at the hangar at Lakehurst, N. J., and another rigid ship, the ZR3, is being built for the Navy at the Zeppelin plant in Germany as part of the indemnity award. The Goodyear Tire & Rubber Co. at Akron, Ohio, is building a large semi-rigid airship for the Army Air Service.

The experimental aircraft carrier Langley was commissioned early in 1922; and in August two other ships, the Saratoga and Lexington, were started. They will also become aircraft carriers and will operate with the fleet. The catapult for launching planes from the decks of battleships has been perfected, and will soon be placed on all major warships. The idea of ship planes is not, however, confined to the larger craft, for even submarines are scheduled eventually to be equipped with planes.

Developing Aerial Lighthouses

The Army, Navy and Air Mail are developing aerial beacons with the co-operation of the American Gas Accumulator Co., the General Electric Co. and other manufacturers. The Navy has installed a beacon at Hampton Roads, the army a similar type at McCook Field where night flying is the rule instead of an exception. The Air Mail is perfecting its night-flying equipment between Chicago and Cheyenne, so that when in operation continuous flying mail service will be possible from Coast to Coast.

Regular air routes have been established by the Air Service throughout the country, principally between all military posts, and practically all official travel is done by plane.

The Aeronautical Chamber of Commerce of America was organized last January. During the year it more than doubled its membership, showing the growth of the industry among manufacturers and operators.

American aviation, meanwhile has attracted the interest of the great public. At the First National Air Institute held in Detroit last October, papers were read by representative leaders in finance, business, industry, law, insurance and the aviation industry. Their views coincided in that they endeavored to show the vast influence aviation must have in everyday affairs. At the Second National Aero Congress following the institute, the National Aeronautic Association was organized. Its membership propose to help "make America first in the Air." The association is not industrial, nor does it represent any particular group, but is representative of all citizens who are determined to foster aviation as a vitally important arm of the national defense.

Aviation in the Middle-West: A happy trio of Longren sport planes resting in one of the innumerable natural landing fields for which Kansas is noted

personal equation, the only human intervention required being in the reading of the second hand on the clock at the instant when the camera is started. This could also be eliminated by additional mechanism, but its elimination is unnecessary, as the one-second interval in which the switch is thrown to start the camera can be read with absolute certainty with even the most moderate care on the part of the observer. At the finish of the race the whole proceeding is repeated and the time of finish is obtained as was the time of start.

Even without using a high-speed camera the time could be obtained with an ordinary moving picture camera to within two or three hundredths of a second, or much better than is possible with manual timing, as the examination of successive exposures would permit of interpolation and the determination of the fraction of an exposure interval which had elapsed when the airplane crossed the wire. For example, if sixteen exposures were being made per second and the fifth exposure in a given second shows the machine three feet short of the wire while the sixth shows it twelve feet past the wire, it is obvious that the airplane crossed when one-fifth of the interval between these exposures had elapsed and the fraction of a second would therefore be $\frac{5.2}{16}$ or 0.32 sec. Ordinarily shutter interruption of the film at one-second intervals would not be satisfactory with the slow-speed camera. Shutter interruption can be replaced, either in this instance or in the high-speed camera by a device similar to that employed for timing in free flight tests at Rijkstudiedienst voor Luchtvaart, the official Dutch aeronautical laboratory. This consists simply of a watch or clock; in the case under discussion a clock should be used fixed in front of the camera in such a position and at such a distance that a small image of its face will appear on every exposure. The exact time when the second hand moves or the pendulum finishes its swing can then be seen directly on the film, while three-quarters of the original space of film remains available for the photographing of the airplane in crossing the line.

Where time trials over a straight-away course are to be dealt with, as in the case of the F.A.I. records, two cameras must, of course, be used, one at each end of the course. The procedure is the same as that previously described in all respects except that one clock must now control the shutters of both cameras in exact synchronism through the medium of a single electric circuit, or, if the method of photographing the clock itself on the film is adopted, the clock should be replaced by two seconds pendulums in front of the two cameras at the ends of the course and electro magnetically released at exactly the same instant. The two pendulums will then beat in synchronism and the number of beats of the pendulum, plus the fractions of a beat as shown on the film, will permit of the exact determination of the times after the release of the pendulums at which the airplane crosses both start and finish lines.

Calculating Speed from Time

An accurate method of timing having been obtained there remains to be considered only the method of calculating the speed made from the times recorded. That step may seem too simple to require comment, yet it is in the interpretation of the readings of the watch that a fundamental flaw exists in the method hitherto used by the F.A.I. In connection with the recent record attempts in France, for example, it is recorded that James, in the Gloucestershire Mars I, made his four runs in 10.8, 9.8, 11.4, and 10.2 sec., respectively. The average time for the first two runs over the one-kilometer course was therefore 10.3 sec. and that for the last pair 10.8 giving average speeds of 349.514 and 333.333 kilometers an hour, a grand average of 341.423.

The inherent fallacy of this method of calculating speed should be immediately apparent, but the exact nature and amount of the error can be shown by a very simple analysis. Suppose that the maximum air-speed of an airplane is V kilometers an hour and that a wind of velocity u is blowing along the course. The speed over the ground will then be $V + u$ when flying with the wind and $V - u$ when against it, and the mean of speeds separately calculated for the two runs will be V, the true air-speed which is desired. The times required to cover the one-kilometer course on the two runs will be $\frac{1}{V+u}$ and $\frac{1}{V-u}$, respectively. The mean of these two times is

$$\frac{V}{V^2-u^2}$$

and the speed corresponding to this time is

$$V - \frac{u^2}{V}, \text{ or } V\left(1 - \frac{u^2}{V^2}\right)$$

There is therefore an error, the amount of which depends on the ratio of wind speed to airplane speed (assuming the differences of time on the several runs to be entirely due to the wind, which certainly is the major if not the sole cause). Even with modern racing airplanes it is not unlikely that the ratio in question may be as large as one tenth, and the inherent error resulting from averaging the times rather than the speeds will then be one per cent. The direction of the error is such as to penalize the trial flown in the wind. This adds another handicap to the one already inevitably resulting from turbulent atmospheric conditions and making it difficult in any case to realize and maintain the full maximum air speed on a windy day.

To return to the specific case of Herbert James, if the correct method of determining the speed for each run separately is applied those speeds are found to be (following out the rather charitable assumption that timing with an ordinary stop-watch is good enough to justify recording the results to three decimal places) 333.333, 367.347, 315.789, and 352.941 kilometers an hour. The mean is 342.352, approximately 0.3 per cent more than the figure for which James received credit. The difference is, to be sure, far less than the error resulting from the method of timing, but when better timing methods come, as they certainly must, they should at least be used in conjunction with calculations theoretically sound.

The Cruise of the Sampaio Correia II

The H16 type flying boat Sampaio Correia II, Pilot Walter Hinton, bound from New York to Rio de Janeiro, remained in Para, Brazil, (see Dec. 11, issue of AVIATION) from Dec. 2 to Dec. 7. During her stay in Para new propellers, generators and radiators which had been shipped from New York were to be installed in the boat, but as they could not be located, the airmen decided to do without them and took off on Dec. 7 for Maranhao, 380 miles away. An intermediate stop for fuel was to be made at Bragança, 153 miles from Para.

Owing to a 30-mile head wind, the fuel supply was totally consumed after 4 hr. flight, and the boat had to come down in the bay Caete, 15 miles from her goal. A shark trapper's canoe carried three men of the crew to Bragança, where they got gasoline, oil and water, and attempted to have the generators recharged. In the latter they were unsuccessful, so the generators had to be taken back to Para to be recharged, which delayed the departure of the Sampaio Correia II until Dec. 14, when the boat covered the 220 miles distance from Caete Bay to Maranhao (Sao Luiz) in 3 hr. 34 min. There the boat was generally overhauled, which took five days.

On Dec. 19 Pilot Hinton flew from Maranhao to Camocim, 231 miles in 4 hr. 17 min., bucking strong head winds at all altitudes. On the following day the 210 miles from Camocim to Aracaty were managed in 4 hr. 57 min., and on Dec. 21 the Sampaio Correia II flew from Aracaty to Natal, taking 4 hr. 15 min. to cover 185 miles. During the latter journey a leak developed in the radiator, but this was taped up in flight.

On Dec. 22 Pilot Hinton took off from Natal with the intention of reaching Cabedello, 100 miles away, but a broken timing gear forced him to land in Formosa Bay, 46 miles from Natal. In landing in a heavy sea the brace of the port bottom wing buckled under the impact of 18 ft. waves, but the boat was not otherwise damaged.

The Timing of Airplane Speeds

By Edward P. Warner

Professor of Aeronautics, Massachusetts Institute of Technology

Since official records of mechanical flight first began to be kept, it has been the general practice to establish records for maximum speed on the basis of short runs in both directions over a straight-away course. From 1909 down to the present time, the procedure sanctioned by the Fédération Aéronautique Internationale has been to use a one-kilometer course, flying twice in each direction over this course and taking the mean of the four times. At the last meeting of the F.A.I. the rules were changed so that in future a four-kilometer base will be employed. The reason for this was primarily the difficulty of timing with sufficient accuracy over a single kilometer.

Two Difficulties

There are two difficulties, one of them an inherent and unconquerable flaw, in the methods employed in the past for making F.A.I. speed records. The first, and the more serious from a practical point of view, is the difficulty of getting strictly accurate times. When records first began to be made the maximum speed of the airplane was about 45 m.p.h. The time required for covering a kilometer was then a little under 50 sec. An ordinary stop watch could be used for the timing, and an error of ⅕ of a second in the time would change the result by only 0.4 per cent or about a fifth of a mile an hour. At the present time, the maximum speed is, as the readers of AVIATION well know, about 225 m.p.h. The time required to cover a one-kilometer course at this speed is a little less than ten seconds. The same error of a fifth of a second means a change of 2 per cent in the time, or of about 4½ m.p.h.

The ordinary stop watch cannot be read closer than a fifth of a second. Even if it is operated and read with meticulous exactness there is always likely, with the usual mechanism, to be an error of a fifth of a second or even a little more. If the actual time of an airplane over a course were 9.85 sec., for example, the watch might read 9⅗, 9 4/5, or 10, depending on the position in which the mechanism happened to be at starting and stopping. The extent of this error, inherent in the watches, can be appreciated by examining the records of running races, where three timers are always used and where it is distinctly exceptional for all three to agree, however great their experience. This divergence is not due to any lapse on the part of the man, as will be seen later, but solely to the limitations of the instrument employed.

In order to find the magnitude of the personal error of a timer, some experiments were recently conducted in England and were reported in one of the British motoring papers. The procedure was to time an automobile trial on a track with two electric chronographs measuring the time to a hundredth of a second, one of them being operated by the car itself pressing two wires together when crossing the starting and finishing lines, while the other was controlled by a telegraph key held by an experienced timer. The first can be taken as absolutely accurate, and the disagreement between the two was about 1/20 of a second. This may therefore be accepted as a measure of the reaction time of the individual and of the probable personal error, and it will be seen that it is much less than the error arising from the watch.

Obviously then the first step to be taken, if more accurately timing of events is desired, is to give the timer a better instrument for the purpose. Special stop watches are now available giving the time to a hundredth of a second instead of a fifth, and their price is quite reasonable. A still better arrangement, although a less portable one, is to use an electric timing device operated with a telegraph key, as in the experiments just cited. This was the general procedure in the recent Detroit races. The practice in France, however, has been to adhere to the ordinary stop watch, and there as elsewhere there is coming to be general appreciation of the absurdity of timing an airplane flight with an instrument giving an inherent error of nearly five miles an hour in the calculated speed and of then entering the record on the books stated to six significant figures.

Personal Equation of the Timer

After the stop watch has been eliminated in favor of a more certain timing instrument, there still remains the total suppression of the personal equation of the timer. This has long since been eliminated in all important automobile and motorcycle races, where the timing is purely electric, and to those who have any knowledge of the simplicity and usefulness of electric chronographs it is a source of perpetual amazement that they have not superseded all other devices for the timing of athletic events.

The direct application of electric timing to the airplane of course involves some special difficulties as a vehicle moving in three dimensions is unable to break wires or to press them together in passing over them. There are, however, various means by which the airplane can be made to record its own passage of the finish line.

By far the simplest arrangement that has occurred to the writer is a photographic one, the airplane being "shot" with a high-speed moving picture camera as it crosses the start and finish lines. Such a camera can be operated to make 150 exposures per second at a constant speed, and if it is placed directly on the finish line and aimed perpendicular to the line to flight, the instant when the airplane crosses the line can readily be determined to a hundredth of a second. It is necessary, however, that some definite timing device be added to the camera. It is, of course, not desirable to keep a camera running and using ten feet of film per second during the duration of an airplane race. Even if that extravagant method were employed there would be difficulty with the determination of the time, as the speed of a camera is not constant enough at a known figure to calculate the time of a race by counting the number of exposures on the film.

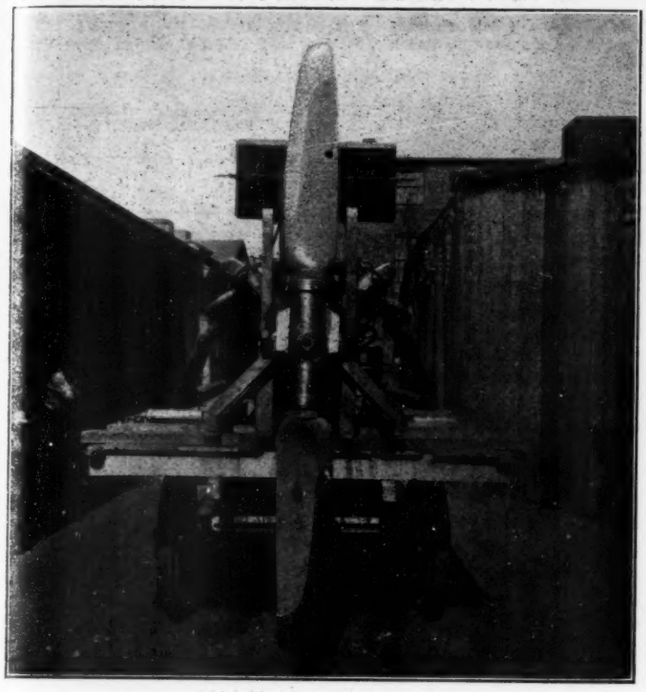
A practical method appears to be to connect a clock with a seconds pendulum to the shutter of the moving picture camera or to an auxiliary shutter in front of the camera in such a way that the pendulum, making an electrical contact at the end of each swing, closes the shutter for the duration of one exposure at each contact. In examining the record of the film a clear mark in the form of a blank exposure will then be found at one-second intervals. It is, of course, also necessary to establish the particular one-second interval in which the airplane crosses the line, or in other words to determine completely the relation between the clock and camera. This can be done by the observer.

How the Device Works

The working of such a device as that just briefly outlined can best be illustrated by actually following through the process of timing a trial. The pendulum clock is running continuously. As the airplane is seen approaching the starting line the camera is started, a few seconds before the arrival of the machine. The camera should be started during a swing of the pendulum and the time of starting noted. The exact second during which the start is made can, of course, easily be read and recorded. The camera then continues to run, photographing the airplane as it approaches the starting line and crosses it. On removal and development of the film, the second in which the machine crosses the line is determined by counting the number of blank exposures, each corresponding to an interruption by the pendulum-operated shutter, from the time when the camera started until the airplane arrived. The fraction of a second is similarly given by the number of exposures from the blank to the exposure which shows the machine just above the wire, divided by the total number of exposures between blanks, this being the number in one second. The time of starting can thus be obtained to a hundredth of a second without difficulty and without introduction of any

The Paragon Adjustable and Reversible Propeller

Change from Full Speed Ahead to Reverse Made in 3 Seconds



Paragon adjustable and reversible propeller mounted with 150 hp. Hispano engine on a demonstration truck

The Paragon adjustable and reversible propeller is the invention of Spencer Heath, founder of the American Propeller & Mfg. Co., of Baltimore, Md., the first aircraft propeller making firm in America. It comprises a system of special blades and a mechanism for varying the pitch of the blades from zero to 360 deg., while in flight or otherwise.

By adjusting the pitch, either before starting or while the engine is running, to a less than normal angle, the engine is allowed to pick up speed and deliver its maximum power which is necessary in taking-off with a heavier load than the same airplane could otherwise normally carry. Upon reaching the desired altitude, the pitch may be increased by the pressure of a finger on a knob on the dash and the engine run at its most economical speed, still with the possibility of increased speed range should occasion demand.

In landing, the pitch of the screw may be changed to any degree in the opposite direction, or reversed in 3⅓ sec., just before the instant of contact with the ground and the plane brought to a stop in the very shortest space, obviating entirely any prepared ground system of slowing up the machine. This is a feature of especial moment to naval aeronautics where the shortest run after landing is a prime necessity, owing to the confined space which may be available on a ship's deck.

Main Features

It was long realized that the variable pitch and reversible propeller was a development which would travel side by side with supercharged and multi-engined aircraft. The Paragon design avoids the objectionable features ordinarily considered with respect to possibilities in this direction. In the Heath propeller there has been achieved:

(a.) Elimination of continuously running gears, collars or bearings in the pitch control mechanism.

(b.) The use in flight of engine power in place of manual labor in changing the blade angle.

(c.) The absence of any structural limitation to the range of blade angles available as well as the limiting of the blade travel between any two predetermined extreme positions.

(d.) Continuous indication on the instrument board of the blade position.

(e.) Automatic throttling of the engine while the propeller is passing through the position of neutral pitch.

General Description of Propeller

The two wooden or steel blades are fastened into steel sleeves which in turn are held in a steel hub, the centrifugal forces being taken on ball thrusts and torsional and axial forces on plain bearings.

The method of fixing the wooden blades into the steel sleeves is noteworthy. The butt end of each blade is tapered outwardly at a small angle and the surrounding collar is split so that it may be first sprung over the butt and then compressed upon the taper.

The pitch changing mechanism is operated through the application of a braking force to either one of a pair of small brake drums surrounding the engine crankshaft and normally rotating with it. This brake drum is connected through a gear train to the individual blades of the propeller. It is apparent that if the drum is allowed to revolve at crankshaft speed, all the gears will be stationary relative to the propeller and that the pitch angle will remain constant. If, on the contrary, the brake drum is held stationary the gear train will be set into action and the pitch angle of the blade will undergo a continuous change until the brake drum is released.

In order to change the blade angle in the reverse direction, a second brake drum is used, connecting to the worm shaft through an idler which serves to reverse the direction of rotation of the worm shaft. It should be noted that during normal flying none of these gears are operative and that the blades are locked in position by the non-reversible features of the worm and the friction of the connected parts.

The brakes are applied through leather faced shoes operated from the pilot's seat by a light push and pull knob attaching to a brake lever mounted on the drum housing. A small hand crank is provided by which the pitch can be changed while the engine is not running.

Blade Position Indicator

The angular setting of the propeller blades at any instant is a function of the relative motion which has taken place between the two brake drums. The indicating mechanism is therefore operated by gearing from the two brake drums which conveys differential motion to the indicating pointer and the throttling and pitch limiting cams. As long as the two brake drums revolve both at crankshaft speed the indicating hand remains stationary but if either of them is retarded an angular motion is shown on the indicator equal to that experienced by the blades themselves.

The mechanical throttle is provided with springs in both directions so that the pilot can at any time by applying a force on the throttle greater than the initial tension in the springs substitute manual for automatic control.

In the pitch limiting mechanism the control knob normally connects to the brake levers direct, a push increasing and a pull decreasing the pitch. If the control button is held in either operating position until the limiting position of the propeller blade is reached the cam trips a latch plate and renders the control inoperative in that direction while leaving it ready for use in reversing the direction of propeller blade motion.

To show the action under power the propeller has been installed on a 150 hp. Hispano-Suiza engine mounted with gasoline tank, observers' seats, etc., on a trailer truck weighing about two tons which is free to roll on the ground.

"Who's Who in American Aeronautics"

(Copyright, 1921, by The Gardner, Moffat Co., Inc.)

The biographical sketches of men who are prominent in American Aeronautics are printed periodically in AVIATION. The first series have been published in a more durable form, and revised issues will be published from time to time to take care of the frequent changes in station of Army and Navy officers, and such other changes as may occur. As errors and omissions are liable to occur in a compilation of this character, interested parties are requested to notify "Who's Who" Editor of the necessary corrections so the record may be kept up to date.

Georg H. Madelung

MADELUNG, GEORG H., Aeronautical Engineer; born, Rostock, Germany, July 31, 1889; son of Dr. Otto D. Madelung and Hedwig (Koening) Madelung.

Educated: Protestant Gymnasium of Strassburg, Elsass; Universities and Institutes of Technology of Strassburg, Karlsruhe, Berlin-Charlottenburg and Hannover; graduated Civil Engineer and Mechanical Engineer.

Professional: Assistant Engineer, German Institute of Aeronautical Research, Adlershof, stress analysis and static tests of airplanes, Mar. 1914 to outbreak of war; joined German Air Force, Jan. 1915; Assistant Engineer, Flugzeugmeisterei, Adlershof; designed twin-engined Albatross bomber; organized department for examining design and stress analysis of airplanes; trained piloting, May 1917; joined 33rd Pursuit Squadron on Western front; chief of examining department for new types of airplanes, Flugzeugmeisterei, Adlershof, June 1918 to Jan. 1919; on engineering staff of Dr. Hugo Junkers of Dessau, Germany, developing all-metal airplane construction, Sept. 1919, to Mar. 1921; designed glider "Vampyre" for Hanover Institute of Technology, Apr. 1921; worked out modification of theory of screw propellers and in July 1921, obtained doctor degree by thesis on this subject; joined engineering staff of Glenn L. Martin Co., Cleveland, Ohio, Sept. 1921; project engineer of same company, charged with design of Navy spotting monoplane, Jan. 1922 to date.

Flying Rating: Airplane Pilot.

Member: Aero Club of Germany; Wissenschaftliche Gesellschaft fuer Luftfahrt; Verein Deutscher Ingenieure; Society of Automotive Engineers.

Present Occupation: Project Engineer, The Glenn L. Martin Co.

Address: 1867 Beersford Rd., East Cleveland, Ohio.

Sumner Sewall

SEWALL, SUMNER, Banking; born, Bath, Me., June 17, 1897; son of William D. Sewall and Mary L. (Sumner) Sewall.

Educated: Westminster Preparatory School; Harvard College, 1916-1917; Yale University, 1919-1920.

Professional: Cuban Sugar Co., 1920-1921; International Banking Corp., Barcelona, Spain, 1921-1922.

Aeronautical Activities: Enlisted Paris, Sept. 1917 as Captain, Air Service; trained Tours, France, Sept. to Oct. 1917; Issoudun, Nov. to Feb. 1918; at front with 95th Aero Squadron, Mar. to Nov. 1918; officially credited with the destruction of five enemy airplanes and two enemy balloons; officially discharged at Garden City, Feb. 1919.

Flying Rating: Reserve Military Aviator.

Honors: Distinguished Service Cross with oak leaf; French Legion of Honor and Croix de Guerre; Belgian Order de la Couronne.

Member: New York Circulo Equestre, Barcelona, Spain.

Address: 1142 Washington St., Bath, Me.

Philip G. Johnson

JOHNSON, PHILIP G., Commercial Aviation; born, Nov. 5, 1894, Seattle, Wash.; son of C. S. Johnson and Hannah A. Johnson.

Educated: Public schools and High Schools of Seattle, Wash.; University of Washington, M.E. 1917.

Professional: Associated with father in laundry business, 1915-1917.

Aeronautical Activities: Engineering Dept., Boeing Airplane Co., 1917-1918; Production Manager, Boeing Airplane Co., 1918-1919; Superintendent and Secretary of the Boeing Airplane Co., 1919-1922; Vice President and General Manager, Boeing Airplane Co., 1922 to date.

Member: American Society of Mechanical Engineers; Gov. 9th Dist., National Aeronautic Association.

Present Occupation: Vice President and General Manager, Boeing Airplane Co.

Address: 330 W. Front St., Seattle, Wash.; home, 2432 N. Broadway, Seattle, Wash.

William J. Hammer

HAMMER, WILLIAM J., Consulting Engineer; born, Cressona, Pa., Feb. 26, 1858; son of William Alexander Hammer and Martha Augusta (Beck) Hammer; married, Alice Maude White, Jan. 3, 1894.

Educated: Private, Public and High Schools of Newark, N. J.

Professional: Assistant to Edward Weston, Newark, N. J. 1878; assistant to Thomas A. Edison at his laboratory, 1879-1881; chief electrician, Edison Electric Lamp Wks., 1880-1881; chief engineer, English Edison Electric Light Co., 1881-1882; built first central station for Incandescent Electric Lighting in the world, London, England, 1882; chief engineer, German Edison Co. (A.E.G.), 1883-1884; represented T. A. Edison and all Edison interests at the Franklin Institute Electrical Exposition, 1884; confidential assistant to President of parent Edison Electric Light Co.; Incorporator, Trustee and Secretary of Sprague Electric Railroad & Motor Co.; chief inspector of Central Stations of Edison Co., 1884-1886; general manager and chief engineer, Boston Edison Electric Illuminating Co., 1886-1887; consulting electrical engineer, Cincinnati Centennial Exposition, 1888; represented Thomas A. Edison at the Paris Exposition, 1889; opened office as a consulting engineer and has since been engaged in this work; expert and secretary, Aeronautical Committee of the Hudson Fulton Celebration, 1909.

Aeronautical Activities: Made a balloon flight across France in 1889; chairman of the Jamestown Celebration Aeronautical Congress, 1907; attended all official government flights of the Wright Bros., 1908; referee at First Flying Meet and Tournament of the Aeronautical Society at Morris Park Airdrome, Nov. 3, 1908; built airplane hangars at Governors Island; was one of the syndicate of the Aeronautical Society of America which built and owned the first airplane sold in America, 1909; was charter member, Vice president and Director of the Aero Club of America; referee, starter and judge at airplane meets of the Aeronautical Society at Oakwood Hts. Airdrome, 1912-1913; invented the Radium Luminous Compounds which were extensively used on airplane instruments during the war; made special reports on Cooper Hewitt helicopters.

War Service: Commissioned Major in the U. S. Army, June 4, 1918; attached to the Inventions Section of the War Plans Div. of the General Staff in charge of Aeronautical and Electrical Inventions at Army War College, Dec. 4, 1918; appointed member of the General Staff stationed at the Army War College; cooperated with the Patent Office and the Expert Committee of the Alien Property Commission as representing the Invention Section.

Honors: Elliott Cresson Gold Medal; Scott Medal.

Books: "Navigating the Air" and "Chronology of Aviation" (in collaboration.)

Member: Fellow and Vice Pres., American Institute of Electrical Engineers; Fellow, American Physical Society; President, Edison Pioneers; Society American Military Engineers; Military Order of the World War; National Aeronautic Association.

Present Occupation: Consulting Engineer.

Address: 103 Waverly Place, New York City.

Joseph Stephen Smith

SMITH, JOSEPH STEPHEN, Journalist; born, Detroit, Mich., Oct. 15, 1882; son of Joseph S. Smith and Clara (Schaefer) Smith; married, Bridgetta Breen, Nov. 25, 1912.

Educated: Graded schools; private school.

Professional: Editor on daily newspapers 1896-1914; Editor, Trade Press Publishing Co. 1914-1919; Professor of Journalism, Marquette University, 1915-1918; President, Joseph S. Smith Publishing Co., 1919 to date.

Aeronautical Activities: Secretary, Aero Club of Wisconsin, 1918-1922; General Secretary, National Balloon Race, Milwaukee, 1922.

Member: Aero Club of Wisconsin.

Present Occupation: President, Joseph S. Smith Publishing Co.

Address: 432 Broadway, Milwaukee, Wis.; home, 1013½ Oakland, Milwaukee, Wis.

Bernard H. Mulvihill

MULVIHILL, BERNARD H., Manufacturer; born, Pittsburgh, Pa., June 1890; son of James P. Mulvihill and Anne (Hampsey) Mulvihill; married, Clara D. Kaul, Nov. 7, 1910.

Educated: St. Vincent's College; Duquesne University; University of Pittsburgh, Civil Engineering, 1910.

Professional: Civil Engineering, 1911-1914; Clay Products Mfg. Co., 1914-1920; President, Natural Gas Conservation Co., 1920 to date.

Aeronautical Activities: School of Military Aeronautics, Atlanta, Ga., Dec. 1917; School of Military Aeronautics, Austin, Tex., Feb. 1918; Instruction, Ellington Field, Apr. 1918; Instructor of Aerial Navigation, Dec. 1918; founder and President Aero Club of Pittsburgh; member, Sectional Committee for Aeronautical Safety Code; Vice Pres., National Aeronautic Association.

Flying Rating: Reserve Military Aviator, Apr. 1918.

War Service: 107th Field Artillery, June 1916 to Dec. 1917; U. S. Air Service, Dec. 1917 to Dec. 1918.

Member: Aero Club of Pittsburgh; National Aeronautic Association; Pittsburgh Athletic Association.

Present Occupation: President, Natural Gas Conservation Co.

Address: B. F. Jones Bldg., Pittsburgh, Pa.; home, 914 N. Negley Ave., Pittsburgh, Pa.

William Rude Davis, Jr.

DAVIS, JR., WILLIAM RUDE, Automobile Business; born, Oakland, Calif., Aug. 2, 1895; son of W. R. Davis and M. Otteline (Towne) Rude; married, Maurice Theodora Bell, Oct. 1, 1922.

Educated: Grant Grammar School; Hitchcock Military Academy; Oakland High School; University of California, A.B. 1921.

Professional: Test Dept., Fageol Motor Co., May 1922 to date.

Aeronautical Activities: First airplane flight Apr. 1910; founded Blackstone Hill Aero Club, Oct. 1909, which joined with Oakland Aero Club in 1911; flew in Chanute type glider, July 4, 1910; continued gliding through 1911 and 1912 covering 500 ft. in Mar. 1912; began flying under instruction of R. V. Morris at San Diego, Apr. 1915; attended Martin School, Los Angeles, Calif., June to Aug. 1916.

Flying Rating: Reserve Military Aviator; Hydro Certificate No. 771; Aviator's Certificate No. 999.

War Service: Instructor in Aerodynamics, Ellington Field; O.I.C. Ground Training, Ellington Field, June to Nov. 1918; plane Liason Officer, Tech. Sect. Div. Military Aeronautics, Dayton, Ohio, Nov. 1918.

Member: Blackstone Hill Aero Club; Allied Fliers Club; Oakland Amateur Aero Club.

Address: 404 29th St., Oakland, Calif.

Lessiter Crary Milburn

MILBURN, LESSITER CRARY, Engineer; born, Detroit, Mich., Nov. 4, 1893; son of Charles G. Milburn and Jane Elizabeth (Stockwell) Milburn; married, Audrey X. Munch, May 29, 1917.

Educated: Detroit High Schools; Michigan State College; B.S., M.E., 1914.

Professional: Whitehead & Kales Bridge Wks., 1913-1914; machine, forge and assembly shops of Studebaker Corp., 1914-1916; engineering staff of Maxwell Motor Co., 1916-1917; Glenn L. Martin Co., Mar. 1918; assistant chief engineer, Glenn L. Martin Co., 1919-1921; chief engineer, Glenn L. Martin Co., Feb. 1922 to date.

Aeronautical Activities: Assisted in design and flight trials of original and later Martin Bombers, Martin Mail Planes, Martin-Navy Torpedo Carrier, etc.; prepared designs for Air Service Types XII and XIII which took first awards; supervised design of Martin-Navy Monoplane Spotter recently built and two new Martin-Navy models being built for 1923; designed Martin-Air Service Super-bomber now being built.

Member: National Aeronautic Association.

Present Occupation: Chief Engineer, Glenn L. Martin Co.

Address: Cleveland, Ohio; home, 1253 East 142nd St., E. Cleveland, Ohio.

Membership of the Aeronautical Chamber of Commerce

The following list of membership of the Aeronautical Chamber of Commerce of America, Inc., 501 Fifth Ave., New York, revised to date of Jan. 1, 1923, shows the extent to which this body represents the American aircraft industry.

CLASS "A"

Aeromarine Airways, Inc., Times Bldg., N.Y.C. — C. F. Redden
Aeromarine Plane & Motor Co., Times Bldg., N.Y.C. — C. F. Redden
Airship Manufacturing Co. of America, Hammondsport, N. Y. — C. C. Witmer
Curtiss Aeroplane & Motor Corp., Garden City, N. Y. — F. H. Russell
Dayton Wright Company, Dayton, Ohio, — G. M. Williams
G. Elias & Bro., Inc., Buffalo, N. Y. — A. J. Elias
Gallaudet Aircraft Corp., East Greenwich, R. I. — J. K. Robinson, Jr.
Goodyear Tire & Rubber Co., Akron, Ohio. — W. C. Young
E. M. Laird Company, 409 First Natl. Bank Bldg. Wichita, Kan. — E. M. Laird
J. L. Aircraft Corp., 347 Madison Ave., N. Y. C. — John M. Larsen
Lawrance Aero-Engine Corp., 644 W. 44th St., N.Y.C. — Chas. L. Lawrance
L. W. F. Engineering Co., College Point, N. Y. — A. H. Flint
Chance Vought Corp., Review & Borden Aves., Long Island City, N. Y. — Chance Vought
Loening Aeronautical Engineering Corp., 31st St. & East River, N.Y.C. — Grover C. Loening
Longren Aircraft Corp., Topeka, Kansas — W. D. Wallace, Secy.
Manufacturers Aircraft Assn., Inc., 501-5th Ave., N. Y. C. — S. S. Bradley
National Aircraft Underwriters Assn., 120 W. 42nd St. N.Y.C. — Edmund Ely
Packard Motor Car Co., Detroit, Mich. — J. G. Vincent
Thomas-Morse Aircraft Corp., Ithaca, N. Y. — F. L. Morse
Wright Aeronautical Corp., 238 Lewis St., Paterson, N. J. — F. B. Rentschler

CLASS "B"

Aluminum Co. of America, 2400 Oliver Bldg., Pittsburgh, Pa. — Edward K. Davis, Vice Pres.
American Bronze Corp., Berwin, Pa. — R. O. Sperry
American Hammered Piston Ring Co., Baltimore, Md. — W. C. Stettinius
B. G. Corp., 136 W. 52nd St., N.Y.C. — A. J. Goldsmith
H. Barber, Underwriting Agent, Hartford Fire Ins. Co., Hartford Accident & Indemnity Co., 30 East 42nd St., N.Y.C.
Bijur Motor Appliances Co., 243 Central Ave., Hoboken, N. J. — Chas. Marcus
A. & D. R. Black, 25 Brixton Road, Garden City, N. Y. — Archibald Black
Brewster & Co., Bridge Plaza, Long Island City, N. Y. — Philip B. Brewster
Vincent J. Burnelli, 50 E. 42nd St., N. Y. C.
Champion Ignition Co., Flint, Mich. — Albert Champion
Cox-Klemin Aircraft Co., College Point, N. Y. — Alexander Klemin
The Douglas Co., 2435 Wilshire Blvd., Santa Monica, Calif. — Donald Douglas
Eastman Kodak Co., Rochester, N. Y. — Paul Favour, Mgr. Service Dept.
Electric Storage Battery Co., Allegheny Ave. & 19th St., Phila., Pa. — Paul R. Moffatt
Endicott Forging & Mfg. Co., Endicott, N. Y. — S. J. Marshall
Fairchild Aerial Camera Corp., 136 W. 52nd St., N. Y. C. — S. M. Fairchild
General Aluminum & Brass Mfg. Co., Detroit, Mich. — G. G. Power, Sales Mgr.
B. F. Goodrich Rubber Co., Akron, Ohio — Henry Wacker
Hamilton Aero Mfg. Co., Milwaukee, Wis. — Thos. F. Hamilton
Stewart Hartshorn Co., 250-5th Ave., N. Y. C. — B. E. Bushnell
Johnson Airplane & Supply Co., Dayton, Ohio — J. M. Johnson
Linde Air Products Co., 30 East 42nd St., N. Y. C. — W. M. Beard, Vice Pr.
Macwhyte Company, Kenosha, Wis. — George S. Whyte
C. L. Maguire Petroleum Co., McCormick Bld., Chicago — W. W. Wyman
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston — O. C. F. Meisel or S. A. Smith
Mosler Metal Products Corp., Bx. 292, Mt. Vernon, N. Y. — Geo. Margolin
New Jersey Veneer Co., Lakeview, Paterson, N. J. — F. T. Perrine
New York Blue Print Paper Co., 102 Reade St., N. Y. C. — T. J. Gilmore
Park Drop Forge Co., Cleveland, Ohio — G. C. Gordon
Pennsylvania Hardware & Paint Co., 461 1st Ave., N. Y. C. — M. R. Porter
Perry-Austen Mfg. Co., Grasmere, Staten Island, P. O. Rosebank, N. Y. — Lewis H. Austen
Pioneer Instrument Co., 135 Havemeyer St., Bklyn, N. Y. — Chas. H. Colvin
Radio Corp. of America, 233 Broadway, N. Y. C. — Elmer E. Bucher
Rich Tool Co., 80 E. Jackson Blvd., Chicago, Ill. — O. A. Carry, Vice Pr.
Simms Magneto Co., East Orange, N. J. — V. W. Kliesrath
S. K. F. Industries, 165 Broadway, N. Y. C. — C. N. Benson
Lawrence Sperry Aircraft Corp., Farmingdale, N. Y. — Lawrence B. Sperry
Splitdorf Electrical Co., 98 Warren St., Newark, N. J. — G. V. Sass
Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago, Ill. — Allan Jackson, Vice Pr.
Steel Products Co., Cleveland, Ohio — C. E. Thompson
Stout Engineering Laboratories, 6282 Beaubien St., Detroit, Mich. — Wm. B. Stout
The Texas Co., 11 Battery Place, N. Y. C. — F. D. Gatchell, Asst. Sales Mgr.
Tide Water Oil Sales Corp., 11 Bway., N. Y. C. — F. D. Shields
Valentine & Co., 456-4th Ave., N. Y. C. — Langdon B. Valentine
Western Brass Mfg. Works, 2007 Marshall Blvd., Chicago — H. J. Youngquist
Wolverine Lubricants Co. of N. Y., 44 Whitehall St., N. Y. C. — C. H. Ellingwood, Pres.
The Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio — F. W. Wood, Pres.
Zenith Carburetor Co., Ft. of Hart Ave., Detroit, Mich. — V. I. Shobe, Asst. Gen. Mgr.

CLASS "C"

Heraclio Alfaro, Montera 53, Madrid, Spain.
American Aircraft, Inc., Sta. F., Box 104, Wilmington, Del.
E. R. Armstrong, Dupont Engineering Co., Wilmington, Del.
Frank E. Baldwin, Wright Aeronautical Corp., Paterson, N. J.
David Beecroft, (Class Journal Company), 239 W. 39th St., N. Y. C.
Luther K. Bell, 501 Fifth Ave., N. Y. C.
W. N. Bennett, L. W. F. Engineering Co., College Point, N. Y.
L. W. Bettinger, L. W. F. Engineering Co., College Point, N. Y.
J. J. Boland, Aeromarine Plane & Motor Co., Keyport, N. J.
R. R. Blythe, Johnson & Higgins, 49 Wall St., N. Y. C.
S. S. Bradley, 501 Fifth Ave., N. Y. C.
George W. Browne, Curtiss Aeroplane & Motor Corp., Garden City, N. Y.
Harry A. Brun, Aeromarine Engineering & Sales Co., Times Bldg., N. Y. C.
Garey W. Carr, (*The Ace*), Marsh-Strong Bldg., Los Angeles, Calif.
John R. Cautley, Wright Aeronautical Corp., Paterson, N. J.
A. J. Chalmers, Cine-Mundial, 512-5th Ave., N. Y. C.
Albert Champion, Champion Ignition Co., Flint, Mich.
Roland Chilton, Aeromarine Plane & Motor Co., Keyport, N. J.
Virginius Clark, Dayton Wright Co., Dayton, Ohio
Fred H. Colvin, (*American Machinist*), 475-10th Ave., New York City.
S. C. Coon, Curtiss Aeroplane & Motor Corp, c/o Adolphus Hotel, Dallas, Tex.
Henry M. Crane, 44 W. 44th St., N. Y. C.
Glenn H. Curtiss, Garden City, N. Y.
Curtiss Aeroplane Export Corp., 52 Vanderbilt Ave., N. Y. C. — C. W. Webster
Curtiss Eastern Airplane Co., 130 S. 15th St., Phila., Pa. — G. Sumner Ireland
Curtiss Metropolitan Airplane Co., 505 Fifth Ave., N. Y. C.
John Adams Davis, General Photographic Service, 260 W. 34th St., N .Y. C.
Diggins Aviation Co., 140 N. Dearborn St., Chicago, Ill.
Ladislas d'Orcy, (*Aviation*), 225 Fourth Ave., N. Y. C.
Donald Douglas, The Douglas Co., 2435 Wilshire Blvd., Santa Monica, Calif.
Easter Airways, Inc., 9 E. Lexington St., Baltimore, Md. — Conway W. Cooke
Leon T. Eliel, Photomap Co., 43 Green St., Pasadena, Calif.
Sherman M. Fairchild, Fairchild Aerial Camera Corp., 136 W. 52 St., N. Y. C.
F. W. Farris, 2049 So. California St., Stockton, Calif.
Earl N. Findley, (*U. S. Air Service*), Star Building, Washington, D. C.
A. G. Flachbar, L. W. F. Engineering Co., College Point, N. Y.
Albert H. Flint, L. W. F. Engineering Co.. College Point, N. Y.
Edson F. Gallaudet, Gallaudet Aircraft Corp., East Greenwich, R. I.
John R. Gammeter, B. F. Goodrich Rubber Co., Akron, Ohio.
L. D. Gardner, Gardner-Moffat Co., (*Aviation*), 225 Fourth Ave., N. Y. C.
Valentine Gephart, International Aircraft Co., 1003 Scarritt Bldg., Kansas City, Mo.
W. L. Gilmore, Curtiss Eng. Corp., Garden City, N. Y.
Chas J. Glidden, (*Aeronautical Digest*), 342 Madison Ave., N. Y. C.
Grant Marine Motor Co., 912 E. Grand Blvd., Detroit, Mich. — H. M. Grant.
Charles Ward Hall, 339 Lexington Ave., N. Y. C.
Clarence D. Hanscom, 22 Chelsea Place, East Orange, N. J.
J. L. Harkness, L. W. F. Engineering Co., College Point, N. Y.
Fred S. Hardesty, 26 Jackson Place, Washington, D. C.
William Hartman, c/o H. M. Bennett, 153 W. 23rd St., N. Y. C.
Beckwith Havens, Airship Mfg. Co. of America, Hammondsport, N. Y.
William Henry, The Douglas Co., 2435 Wilshire Blvd., Santa Monica, Calif.
Hugh H. Hirshen, W. S. Wilson Corp., 155 Chambers St., N. Y. C.
George H. Houston, 60 Broadway, N. Y. C.
Huff Daland Aero Corp., 1018 Commerce Bldg., Kansas City, Mo.
W. M. Huskisson, c/o Vickers, Ltd., 2550 Woolworth Bldg., N. Y. C.
G. Sumner Ireland, Curtiss Eastern Airplane Co., 130 S. 15th St., Phila., Pa.
Temple N. Joyce, 709 Equitable Bldg., Baltimore, Md. (Morane Saulnier)
W. Wallace Kellett, 717 Widener Bldg., Philadelphia, Pa. (Farman)
C. F. Kettering, General Motors Corp., Dayton, Ohio.
C. Roy Keys, Curtiss Aeroplane & Motor Corp., Garden City, N. Y.
W. C. Kidder, Curtiss Northwest Airplane Co., 707 Met. Bank Bldg., Minneapolis, Minn.
William Klein, 839 Post Street, San Francisco, Calif.
Alexander Klemin, Cox-Klemin Aircraft Corp., College Point, N. Y.
Herman T. Kraft, Goodyear Tire & Rubber Co., Akron, Ohio
Chas. L. Lawrance, Lawrance Aero-Engine Corp., 644 W. 44th St., N. Y. C.
Wm. B. Lebhers, 522 Elm Street, Frederick, Md.
Albert P. Loening, Loening Aeronautical Engineering Corp., 31st St. and East River, N. Y. C.
Grover C. Loening, Loening Aeronautical Engineering Corp., 31st St. and East River, N. Y. C.
Chas. M. Manly, 250 W. 54th St., N. Y. C.
J. C. Mars, 1881 Bway., N. Y. C.
Hamilton Maxwell, 6 E. 39th St., N. Y. C.
George Mead, Wright Aeronautical Corp., Paterson, N. J.
H. L. Mingos, 501 Fifth Ave., N. Y. C.
F. L. Morse, Thomas-Morse Aircraft Corp., Ithaca, N. Y.
Arthur E. Nesbitt, c/o Fairchild Aerial Camera Corp., 136 W. 52 St., N. Y. C.

Robt. B. C. Noorduyn, Netherlands Aircraft Mfg. Co., 286 5th Ave., N. Y. C.
Arthur Nutt, Curtiss Aeroplane & Motor Corp., Garden City, N. Y.
J. Brooks B. Parker, 320 Walnut St., Philadelphia, Pa.
C. G. Peterson, Wright Aeronautical Corp., Paterson, N. J.
Stephen H. Philbin, 5 Nassau St., N. Y. C.
L. L. Pope, Wright Aeronautical Corp., Paterson, N. J.
Otto Praeger, Grand Central Terminal Bldg., N. Y. C.
J. F. Prince, Wright Aeronautical Corp., Paterson, N. J.
Chas. F. Redden, Aeromarine Airways, Inc., Times Bldg., N. Y. C.
H. J. Reilly, (*Army and Navy Journal*), 354-4th Ave., N. Y. C.
F. B. Rentschler, Wright Aeronautical Corp., Paterson, N. J.
Herman B. Ring, Lawrance Aero-Engine Corp., 644 W. 44th St., N. Y. C.
Robertson Aircraft Corp., 5248 Oakland Ave., St. Louis, Mo.
J. K. Robinson, Jr., Gallaudet Aircraft Corp., 522 Fifth Ave., N. Y. C.
John M. Rogers, Wright Aeronautical Corp., Paterson, N. J.
Frank H. Russell, The Rochambeau, Washington, D. C.
Foster Russell Aviation Co., Spokane, Wash.
Edward Schildhauer, 26 Jackson Place, Washington, D. C.
L. W. Schroeder, Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill.
L. R. Seidell, New York Testing Laboratories, 80 Washington St., N. Y. C.
C. A. Shannon, 501 Fifth Ave., N. Y. C.
A. R. Small, Underwriters Laboratories, Inc., 207 E. Ohio St., Chicago, Ill.
Daisy Smith, 203½ River Ave., Spokane, Wash.
Lawrence Sperry, Lawrence Sperry Aircraft Corp., Farmingdale, N. Y.
Marion Sterling, Franklin Motor Car Co., Waco, Tex.
Wm. B. Stout, Stout Engineering Laboratories, 6282 Beaubien St., Detroit, Mich.
Joseph B. Strauss, 225 N. Michigan Ave., Chicago, Ill.
H. E. Talbott, Dayton Wright Co., Dayton, Ohio.
J. P. Tarbox, Curtiss Engineering Corp., Garden City, N. Y.
Robert G. Thach, 120 Bway., N. Y. C.
Milton Tibbetts, Packard Motor Car Co., Detroit, Mich.
Triangle Airways, Inc., 2229 S. Michigan Ave., Chicago, Ill.
I. M. Uppercu, 1881 Broadway, N. Y. C.
Ralph H. Upson, 606 Penobscot Bldg., Detroit, Mich.
Adrian Van Muffling, Van Muffling & Marx, 280 Madison Ave., N. Y. C.
Walter T. Varney, 889 Post St., San Francisco, Calif.
J. G. Vincent, Packard Motor Car Co., Detroit, Mich.
Harry Vissering, "Luftschiffbau-Zeppelin", 14 E. Jackson Blvd., Chicago, Ill.
Chance M. Vought, Chance Vought Corp., Review & Borden Aves., Long Island City, N. Y.
Henry Wacker, B. F. Goodrich Co., Akron, Ohio.
G. Douglas Wardrop, (*Aerial Age Weekly*), 5942 Grand Central Terminal Bldg., N. Y. C.
Prof. Edw. P. Warner, Massachusetts Institute of Technology, Cambridge, Mass.
George S. Wheat, 1 W. 34th St., N. Y. C.
Chester L. Williams, Williams Bros. Aircraft Corp. of Calif., San Francisco, Calif.
G. M. Williams, Dayton Wright Co., Dayton, Ohio.
C. C. Witmer, Airship Mfg. Co. of America, Hammondsport, N. Y.
John Perry Wodd, 2620 Main St., Buffalo, N. Y.
Orville Wright, Dayton, Ohio.
W. W. Wyman, C. L. Maguire Petroleum Co., Chicago, Ill.
W. C. Young, Goodyear Tire & Rubber Co., Akron, Ohio.
Paul Zimmermann, Aeromarine Plane & Motor Co., Keyport, N. J.

New Orleans--Pilot Town Air Mail

The following additional information has been received from the New Orleans Association of Commerce with regard to the proposed Air Mail Service between New Orleans and Pilot Town.

The service was proposed by the New Orleans Postmaster with the support of the Postal Facilities Committee of the Traffic and Transportation Bureau of the New Orleans Association of Commerce.

New Orleans has an airplane landing field located at the old city park race track now owned and controlled by the city of New Orleans. There are no hangars on it. Its location is slightly northwest of the foot of Canal Street, about four or five miles from the point where mail is to be taken on for Pilot Town. There is another field in the upper section of the city, commonly known as the Peters Avenue Airplane Landing Field, which was used during the American Legion Convention by sixteen airplanes. There are no hangars on it, and the owner is unwilling to give a long lease.

In the opinion of the New Orleans Association of Commerce, land planes are useless for the proposed service to Pilot Town, the reason being that the fields in New Orleans are too far distant from the mail terminal and that at Pilot Town no land facilities exist, the town itself being built on stilts driven into the marshy soil. Hence, seaplanes are absolutely necessary. In New Orleans seaplanes can make a landing conveniently in the river, both at the foot of Canal Street where the river is ¾ miles wide, and at Pilot Town, where the river is 1¼ mile wide.

The airplane operator taking the Air Mail contract would not also be obligated for the transportation of the mail from the New Orleans Post Office to the air terminal, this being a separate contract under the local Postmaster. It is regarded by the New Orleans Association of Commerce as necessary for the operator to have a motor boat at Pilot Town, in which to handle the mail to the steamers from the plane. It is possible that a satisfactory arrangement could be made with the Pilots' Association, whereby mail would be transferred in the same motor boat used by the pilots in transferring from incoming and outgoing ships to the wharf at Pilot Town.

As to meteorological conditions, the New Orleans Association of Commerce states:

"The mean temperature for the past fifty-one years is as follows: January 54.4; February, 56.9; March, 63.2; April, 68.7; May, 75.2; June, 80.8; July, 82.3; August, 83.8; September, 79.1; October, 70.7; November, 61.7; December, 55.4; yearly, 69.2. The average number of days per year in 25 years with dense fog is 16; with wind velocity over 39 m.p.h. is 2; in 51 years with maximum temperatures 95 or more, 3⅔; with temperature 100 or more, one day every 5 or 6 years; with temperature 32 or less, 4⅔ days; with temperature 25 or lower, less than one day per year.

There are 91 steamship lines entering the port of New Orleans, which the Association of Commerce believes would give the airplane operator an average of at least 300 lb. of first class mail for each trip.

Chinese Gets First N.A.A. Pilot Certificate

Harry Chin, Chinese student of the Curtiss Aviation School at Garden City, L. I., recently obtained the first airplane pilot's certificate issued by the National Aeronautic Association of U.S.A. The flying tests prescribed by the N.A.A. are identical with those of the Aero Club of America which formerly issued pilot's certificates.

Mr. Chin will return at once to his home in Canton where he will remain until summer, giving flying exhibitions and carrying passengers. One of his friends who graduated from the Curtiss School in 1919 has a passenger-carrying business established in Canton, where he uses a Curtiss JN and a Seagull flying boat. Passengers are carried on 10 min. flights for the equivalent of $25. Gasoline costs about 80 cents a gallon and is almost impossible to obtain at distances greater than 50 miles from the few principal cities.

China presents excellent possibilities for aviation, for there are natural landing places every half mile or so—the rice fields. Between the fields there are level cleared spaces where the rice is put out to dry, making ideal places for landing. Even on the rice fields, landings are easily made and with no damage whatever to the crops. China's innumerable waterways and almost complete lack of transportation facilities make the flying boat the most desirable vehicle for commercial enterprises in that country.

Notice to Aviators

Kenilworth Field, Buffalo, N. Y.

E. M. Ronne, manager for the Curtiss Exhibition Co., advises that Kenilworth Field, located about 7½ miles north and a little east of the center of Buffalo, will be kept open during the coming winter and that hangar space and gas and oil will be available.

Landings should be made on the runway only, extending diagonally across the field, and extreme care should be used in wet weather in taxi-ing up to the hangars.

An electric-light line of considerable height is now being erected on the eastern side of the field along the road, and care must be taken in approaching the runway from this side.

Further information regarding this field may be had upon request to E. M. Ronne, Eggertsville Road, Buffa'o, N. Y.

(N. A. 12, '1922.)

ARMY AND NAVY AIR NEWS

Air Service

First Army Towing Airship Performs Well—While the Naval Air Service has for some time past been operating small towing airships, or "pony blimps" as they are more commonly called, the Army Air Service only recently received its first specimen of this type of lighter-than-air craft. The new Army towing airship has a capacity of 43,000 cu. ft., and is 95 ft. long and 31 ft. in diameter. It has a maximum speed of 50 m.p.h. and an endurance of 13 hr. at cruising speed. The ship was built by the Goodyear Tire & Rubber Co. and tested at McCook Field, where the experimental section of Balloon and Airship Division of the Air Service is now stationed.

Recently the towing airship, commanded by Lieut. U. A. Anderson, A.S., made a non stop flight from Scott Field, Ill., to Bynun, Ala., a distance of 450 miles which she covered in 10 hr. This long flight was made in the course of routine work, and it was not intended to operate far from Scott Field. Heavy winds were encountered aloft, however, and the pilot, realizing that he could not buck them, decided to try for a record performance. Shutting off the engine, Lieut. Anderson let the little ship ride with the wind, as a result of which the distance indicated was covered in remarkably good time for so small a ship.

Towing airships are being developed by the Navy to take the place of kite balloons and accompany the fleet to sea under tow from battleships, the idea being to cut the airships loose and let them proceed under their own power for purposes of observation, a thing the kite balloon could naturally not do.

In land warfare the towing airship may be towed up to a favorable point of the front lines by a truck, or it may proceed there under its own power. Being much smaller than the other types of nonrigid ships used by the Air Service, the towing airship is less expensive to build and operate and has a greater flexibility in use and movement.

* * *

Army Map Shows All Landing Fields—All available information as to landing fields in the United States has been compiled by the Air Service, and a new map hung in the office of the Airways Section now carries between three and four thousand tacks indicating as many landing fields.

The map is a large Rand McNally of the United States, on the scale of 25 miles to an inch. Red pins indicate Army Flying Fields at organized Air Service stations or camps; blue pins designate Naval and Marine fields; White tacks show where Postal Air Mail Fields are situated; Green, designate Commercial landing fields; Purple, municipal fields; Brown, seaplane facilities, and yellow pins indicate unimproved facilities for landing, previously designated as emergency fields. With a special scale ruler, which hangs alongside the big map, it is possible to lay out routes in any part of the country where flights are contemplated. By close reference to the pins on the map it is possible to map out the route along paths where the landing facilities are best organized, and on which detailed information is on file.

The map, with its many tacks, presents several nearly solid lines leading into New York, where there is a group of varihued tacks; there is also a group of tacks of smaller size around San Francisco, and a practically solid line leads from New York to San Francisco via Chicago, designating the route flown daily by the Post Office Air Mail planes. These tacks, although slightly farther spaced toward the western coast than in the eastern part of the country, average about 20 to 25 miles apart along the whole trans-continental route. A flier following the cross-country route, therefore, has a landing field at intervals of every 25 miles; this eliminates the hazards of flying, as there is a landing "haven" available with about every 15 min. of flight. The only long interval on the east-west air route is between Salt Lake City and a point westward on the edge of the desert, where the two stations are about 70 miles apart. Reports on these trans-continental air stations have in the main been furnished the Air Service by the pilots of the Air Mail.

The Model Airway being planned and studied by the Airways Section of the Army, connecting New York, Dayton, Ohio, and Norfolk, Va., with Washington, D. C., the control office, is also clearly shown by the several converging lines of colored pins on the big map.

Aid in plotting practical air routes by commercial or private concerns is granted by the Offices of the Airways Section, as they believe in cooperating in establishing safe air routes over the continent with all aviators.

A line of tacks on the map indicates the route of the Aeromarine flight made recently, while another series shows where Colonel Hartz, made his "around the rim" flight in 1919. A third shows the landing fields laid out or used by the Army patrol on the Mexican Border several years ago.

* * *

Army Airship SST3 Commissioned—The SST3, a "Mullien" type non-rigid-two-man control airship, which has been set up at Scott Field, Ill., under the supervision of Lieut. Frank M. McKee, with Technical Sergeant Olin Brown in charge, has been air tested and found in good condition. This ship is one of the original English bags, and is inflated with hydrogen. It is one of the submarine scout type which was used extensively by the British in 1918 for "spotting" submarines.

The SST is one of the fastest of the Army airships, with a maximum speed of 57.5 m.p.h. It uses two four-blade propellers, driven by two Rolls-Royce "Hawk" type motors, developing 150 hp. It is 165 ft. long, 49 ft. high, 32½ ft. wide, and has a gas capacity of 100,000 cu. ft. The useful lift of the ship is 2240 lb., and its weight is 4,750 lb. The car is designed for five passengers, including the pilots and engineer.

The peculiarities of its construction are the lightness of the bag, which is made of very thin two-ply fabric, and the fact that it has no upper stabilizer.

This type of airship carries 240 gal. of fuel in the four 60-gal. tanks attached to its sides. This amount of fuel is sufficient to keep the ship in the air 12 hr. It has a cruising radius of 690 miles.

The SST3 will be used for training purposes by the Air Service Balloon and Airship School.

* * *

Distribution of Enlisted Personnel—In a summary showing the distribution of the army, enlisted personnel recently reduced to 125,000 as planned, the Chief of Operations and Training Division, states that:

In the Air Service the pro rata reduction gives that service 6,990, the adjusted reduction 8,500, the increase being 1,510 men. The adjusted figure is 500 more than the Q. M. Corps has and 1371 less than those assigned to the Cavalry. The distribution of the Air Service men would assign 1,884 American soldiers to overseas stations, and leave 6,616 in the United States. Three Air Groups, including Pursuit, Attack and Bombardment, all active, and one Airship Company active would be stationed in this country proper.

The following Air Service plants and depots are in the course of being closed out, according to a report of the Chief of the Supply Division: Curtiss Elmwood Plant; Long Island Engine Plant; and Depots at Richmond, Morristown, Americus and Montgomery.

Death Notices—The Adjutant General's Office has issued the following death notices:

GUY L. GEARHART

Born in Iowa June 1, 1879. Appointed from the Army. Pvt. and Mr. Elec. Arty. C., Aug. 20, 1903, To July 22, 1907; 2nd Lieut. C.A.C., June 8, 1907; 1st Lieut., July 16, 1907; Accepted, July 23, 1907; Captain, July 1, 1916; Av. Sec. Sig. C., June 27, 1917; Major (temp) Jan. 31, 1918, to Nov. 6, 1918; Detail Av. Sec. Sig. C. term. June 30, 1920; Trfd. to A. S., July 1, 1920; To rank from July 1, 1916; Major, July 1, 1920.

In Federal service other than the permanent establishment—Pvt. Co. C, 52nd Iowa Inf., June 24, 1898; to Oct. 30, 1898; Lt. Col. C.A.C., U.S.A., Oct 30, 1918; Accepted, Nov. 7, 1918; Hon. discharged, Feb. 20, 1920. Distinguished graduate C. Arty. School, 1911. Graduate Advanced Course, C. Arty. School, 1912 B.M.E. Iowa State College, 1903.

Service—He was on leave of absence from Aug. 17, 1907, to Aug. 26, 1907; with 152nd Co., C.A.C., Ft. Banks, Mass., from Aug. 30 to Sept. 10, 1907; with 46th Co., C.A.C., Ft. Strong, Mass., from Sept. 10, 1907, to July 9, 1908; on leave of absence July 11 to Aug. 8, 1908; with 7th Co., C.A.C., Ft. Banks, Mass., to Sept. 11, 1909; Quartermaster Arty. District of Boston Aug. 1, 1909, to Apr. 1, 1910, and with 152nd Co., C.A.C., Fort Banks, Mass., to July 27, 1910; on leave of absence July 28, 1910, to Aug. 25, 1910; student, Coast Arty. School, Ft. Monroe, Va., from Aug. 28, 1910, to Aug. 27, 1912 (sick Nov. 21, 1911, to Nov. 22, 1911) and Instructor, Coast Arty. School, Ft. Monroe, Va., Aug. 28, 1912, to Dec. 28, 1913; with 135th Co., C.A.C., Ft. Totten, N Y., Dec. 30, 1913, to Feb. 19, 1915; on leave of absence from Feb. 20 to Feb. 28, 1915; enroute from Ft. Totten, N. Y., to Ft. Kamehameha, H. T., from March 1 to March 13, 1915; Ft. Kamehameha, H. T., to Nov. 7, 1916; enroute to United States to Nov. 16, 1916; at S. C. Aviation School, San Diego, Calif., Nov. 20, 1916, to July 28, 1917; commanding Officer and at School for Aerial Observers, Ft. Sill, Okla., to Nov. 30, 1917; in Office, Chief Signal Officer, Washington, D. C., to Feb. 28, 1918; Commanding Aviation Repair Depot, Speedway, Indianapolis, Ind., to Aug. 4, 1918; enroute to France, on duty with A.E.F. and enroute to the United States Aug. 8, 1918, to July 12, 1919; with Engineering Div., Air Service, McCook Field, Dayton, Ohio, from July 17, 1919, to Aug. 24, 1920; with Engineering Division, Air Service, Farmingdale, L. I., N. Y., to Nov. 28, 1922, (temporarily with Eng. Div. McCook Field, Ohio, Apr. 28 to Oct. 11, 1921; Oct. 26 to Nov. 23, 1921, and Dec. 9, 1921, to Apr. 11, 1922, May 2, 1922, to July 27, 1922, Aug. 1 to Aug. 23, 1922, Oct. 31 to Nov. 21, 1922—under observation and treatment at Walter Reed General Hospital, Takoma, D. C., Aug. 24 to Sept. 30, 1922—on leave of absence Oct. 1 to Oct. 30, 1922; Langley Field, Va., from Nov. 29, 1922, to Dec. 6, 1922, date of death.

He was killed instantly in airplane crash at 9.45 a. m., Dec. 6, 1922, at Langley Field, Va.

BENTON A. DOYLE

Born in Mo. Feb. 27, 1886. Appointed from California. 1st Lieut. A. S., July 1, 1920; Captain, July 1, 1920; Accepted, Sept. 16, 1920.

In Federal service other than the permanent establishment—1st Lt. F. A. Sec., O.R.C., Aug. 15, 1917; Accepted, Aug. 15, 1917; 1st Lt. A. S., N. A., Aug. 15, 1917; Accepted, Oct. 22, 1918; Vacated, Sept. 16, 1920.

Service—He was on duty at Camp Lewis, Wash., from Aug. 29, 1917, to May, 1918; at Camp Jackson, S. C., to Sept., 1918; Post Field, Ft. Sill, Okla., to Jan. 28, 1919; Barron Field, Tex., to Mar. 17, 1919; Post Field, Ft. Sill, Okla., to April 4, 1919; on leave of absence from Apr. 5 to May 4, 1919; enroute to Honolulu, H. T., to May 15, 1919; with 6th Aero Squadron, Luke Field, Pearl Harbor H. T., to Oct. 10, 1919; enroute to U. S. to Oct 18, 1919; Asst. Dept. Air Service Officer, Headquarters, Western Department, San Francisco, Calif., to Dec. 26, 1919; at Kelly Field, Tex., with 11th Aero Squad. to Jan. 18, 1920; with 1st Day Bombing Group to Jan. 18, 1921, and with 11th Aero Squad., also at Kelly Field to June 26, 1922, (on sick leave Oct. 12, 1920 to Nov. 11, 1920—on detached service at Langley Field, Va., and enroute from May 16, 1921, to Oct. 30, 1921); Langley Field, Va., to Dec. 6, 1922, date of death (absent sick, Ft. Monroe, Va., from July 27 to Aug. 3, 1922, sick in quarters Aug. 3 to Aug. 8, 1922).

He was killed instantly in airplane crash at 9. 45 a. m., Dec. 6, 1922, at Langley Field, Va.

* * *

Farewell Party for Major Hickam—An informal tea party was tendered in honor of Maj. Horace M. Hickam, retiring chief of the Army Air Service Information Section on Dec. 14, by the Air Attaches of the British, French and Italian Embassies. Among those present were Admiral Moffett, chief of the Naval Bureau of Aeronautics, General Patrick, Chief of the Army Air Service, and members of both the Army and Naval Air Services.

Major Hickam expects to leave for his new station at Kelly Field early in the year. He will be succeeded as Chief of the Information Section by Major Ira Rader.

* * *

Reserve Activities on the Pacific Coast—Reserve activities at Crissy Field, Presidio of San Francisco, are on the increase. Under the guidance of the Executive Officer of the 91st Division, Air Service, there are now two squadrons of the Non-divisional group. The 447th Pursuit Squadron has been operating for about two months, but the 440th Observation has just begun.

Of the 24 officers assigned to the 447th, eight have soloed again, which is doing very well for the short time they have been in training. Capt. I. G. Irving, one of the "aces" of the late war, is in command of this organization. Lieut. H. M. Pugh is Operations Officer; H. S. Thompson, Adjutant; V. D. Summerfield, Supply; W. F. Kyle, Engineer, and Lieut. W. V. Morgan in command of the active flight.

The 440th Squadron of San Jose, Calif., the latest of the squadrons to commence training, probably deserves the greatest praise. San Jose is a fine city at the end of the Bay, about 45 minutes' flight from San Francisco. Major George Sykes, the Commanding Officer, must have some very commanding ways about him, for, not only has the squadron a field, but the various oil companies are fighting over the privilege of donating the necessary fuel and lubricant. There are only twelve officers in the squadron at present, and nine of these are out regularly. Capt. A. F. Herold, Air Service, recently flew to San Jose from Crissy Field to inaugurate the new training.

The 316th Reserve Squadron, which has 32 officers (18 fliers and one non-flier being active) is at present engaged in perfecting their formation work. It participated in the celebration of Armistice Day and the unveiling of the Statute of General Pershing, which was erected in Golden Gate Park.

* * *

Sales of Air Service Supplies—The Director of Sales, War Department, announces that an auction sale of Air Service supplies will take place on Jan. 24, 1923, at Fairfield, Ohio. For full information and catalogues address the Chief, Sales Promotion Section, Office of the Director of Sales, Room 2515, Munitions Bldg., Washington, D. C.

Coming Aeronautical Events

AMERICAN

Jan. 3 — Fifth Aviators' Ball, Hotel Astor, New York.

FOREIGN

1923

Dec. 15-Jan. 2 — 8th International Aeronautic Exposition, Paris, France.

June — International Aero Congress, London.

July 20-Aug. 12 — International Aero Exhibition, Gothenburg, Sweden.

Posthumous Citations—The following posthumous citations are announced by the War Department.

MEDAL OF HONOR CITATION—POSTHUMOUS

"Edwin R. Bleckley, second lieutenant, 130th Field Artillery, observer, 50th Aero Squadron, Air Service. For conspicuous gallantry and intrepidity above and beyond the call of duty in action with the enemy near Binarville, France, Oct. 6, 1918. Lieutenant Bleckley with his pilot, First Lieut. Harold E. Goettler, Air Service, left the airdrome late in the afternoon on their second trip to drop supplies to a battalion of the 77th Division, which had been cut off by the enemy in the Argonne Forest. Having been subjected on the first trip to violent fire from the enemy, they attempted on the second trip to come still lower in order to get the package even more precisely on the designated spot. In the course of his mission the plane was brought down by enemy rifle and machine-gun fire from the ground, resulting in fatal wounds to Lieutenant Bleckley, who died before he could be taken to a hospital. In attempting and performing this mission Lieutenant Bleckley showed the highest possible contempt of personal danger, devotion to duty, courage and valor."

MEDAL OF HONOR CITATION—POSTHUMOUS

"Harold Ernest Goettler, first lieutenant, pilot, 50th Aero Squadron, Air Service. For conspicuous gallantry and intrepidity above and beyond the call of duty in action with the enemy near Binarville, France, Oct. 6, 1918. Lieutenant Goettler with his observer, Second Lieut. Erwin R. Bleckley, 130th Field Artillery, left the airdrome late in the afternoon of their second trip to drop supplies to a battalion of the 77th Division which had been cut off by the enemy in the Argonne Forest. Having been subjected on the first trip to violent fire from the enemy, they attempted on the second trip to come still lower in order to get the packages even more precisely on the designated spot. In the course of this mission the plane was brought down by enemy rifle and machine-gun fire from the ground, resulting in the instant death of Lieutenant Goettler. In attempting and performing this mission Lieutenant Goettler showed the highest possible contempt of personal danger, devotion to duty, courage and valor."

* * *

Pilotless Plane Performs—A pilotless airplane, equipped with an automatic control device said to be more accurate and dependable than any human pilot, has been developed to a point where it has made successful flights of more than 90 miles, the Army Air Service announces.

"In actual work with these automatic pilots," the announcement said, "hundreds of automatic take-offs and a number of automatic flights of 90 miles and more have been made. This 'pilot' is capable of being mounted in any type airplane, and in bumpy weather will hold a plane much steadier than a human pilot and will carry it on an absolutely true course, regardless of fog or adverse weather conditions."

In the long series of tests just ended the machine used was one of the small types having a span of only 20 ft., a 60 hp. engine, capable of carrying a useful load of 250 lb. and equipped with an automatic pilot which takes it off the ground, levels off at any predetermined height and will rise to unusual heights. Except for natural deviations of flight, due to unfavorable air currents, the control machinery holds fast to its course for the limit of its gas supply, which, in the equipment of the experimental aircraft, makes possible a sustained flight of two and a half hours.

"Of the automatic pilots being experimented with by the Army Air Service," the statement continued, "that which has proved most successful to date can be described as using a gyroscope for its brains and bellows or pneumatics, similar to those used in player pianos, for its muscles. The ability of a balanced, rotating mass, moving on frictionless bearings, to maintain its position in space, so long as it is not acted upon by outside forces, is called gyroscopic force."

It was said the invention would lead to new methods of bombing, one official asserting it would be entirely practical to load a plane with explosives that would discharge on contact with any target on land or water with great destructive effect. Other military usages, it was predicted, would be discovered as the experiments continued.

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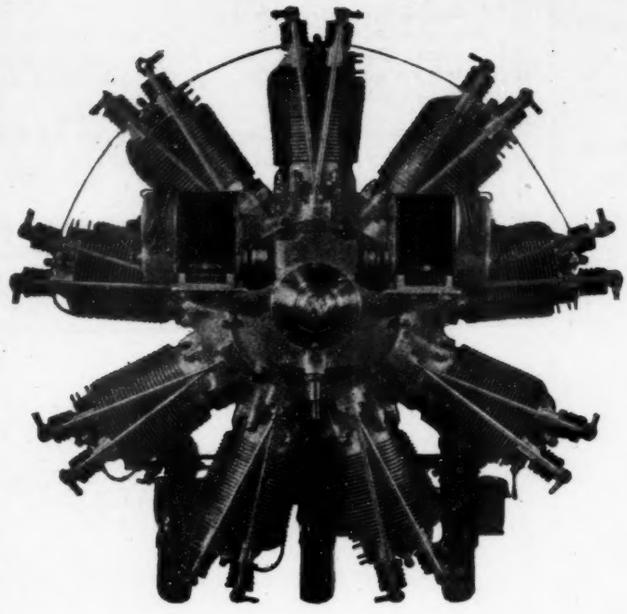

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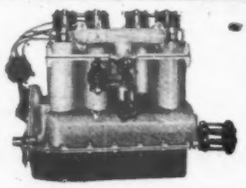

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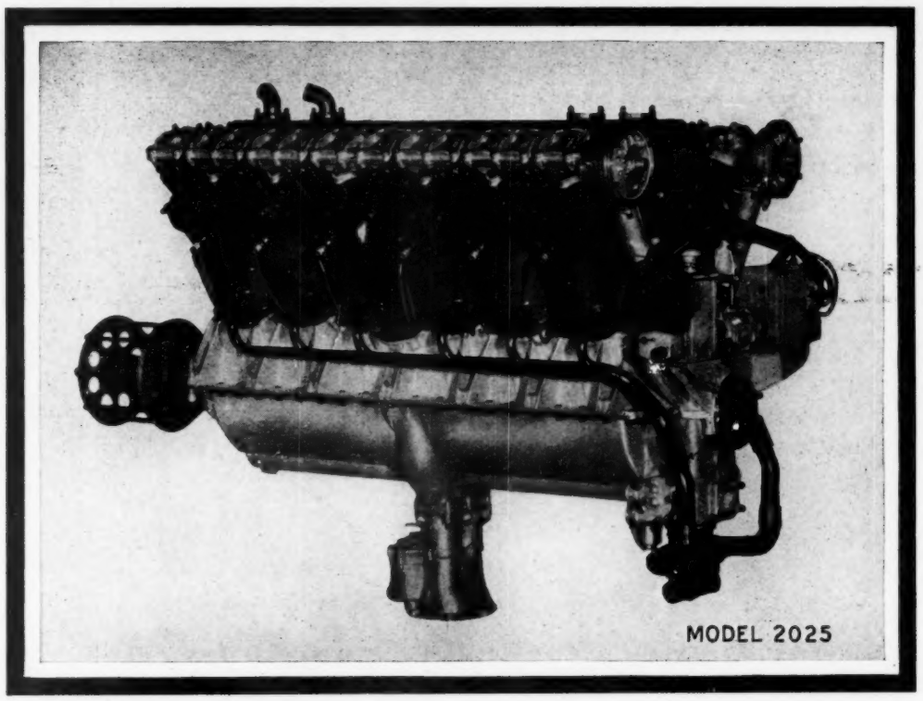

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